# CET-2026

## RAJASTHAN STAFF SELECTION BOARD

**Part - 5**

# SCIENCE & TECHNOLOGY

## Chapterwise MCQ Bank

- 2000+ MCQs with Detailed Explanations
- Based on the Latest RSSB CET Syllabus
- Specialised Study Material for Graduate Level Exam

Nodia

NODIA

Scan QR for Demo PDF

# GET ALL STUDY MATERIAL IN ONE APP!

- Textbooks
- Previous Year Chapterwise Question Banks
- 30 Sets Sample Papers
- Worksheets

**FREE!**

## DOWNLOAD NOW!

**SCAN & DOWNLOAD**

GET IT ON Google Play

# RSSB 2026

## RAJASTHAN STAFF SELECTION BOARD

## COMMON ELIGIBILITY TEST (CET)
## GRADUATE LEVEL

### PART 5

# SCIENCE AND TECHNOLOGY

**Chapter-Wise MCQ Bank**
**As Per the Latest Syllabus**

**Nodia**

Downloaded from www.pdf.tube

RSSB CET Graduate Level Science and Technology Part 5
Edition: July 2026
Published by :Nodia
An Imprint of NODIA EDITIONS LLP

Information contained in this book has been obtained by author, from sources believes to be reliable. However, neither Nodia nor its author guarantee the accuracy or completeness of any information herein and Nodia nor its author shall be responsible for any error, omissions, or damages arising out of use of this information. This book is published with the understanding that Nodia and its author are supplying information but are not attempting to render engineering or other professional services.

© NODIA EDITIONS LLP

NODIA

**MRP ₹580.00**

**NODIA EDITIONS LLP**
125, Sector 6, Vidyadhar Nagar, Jaipur 302039
Phone :+91 9001005245
email : mail@nodia.in

# CONTENTS


| | | |
|---|---|---|
| CHAP : 01 | Information and Communication Technology | 5 |
| CHAP : 02 | Defense Technology | 38 |
| CHAP : 03 | Space Technology and Satellites | 69 |
| CHAP : 04 | Electric Current | 100 |
| CHAP : 05 | Heat, Work and Energy | 131 |
| CHAP : 06 | Diet and Nutrition | 161 |
| CHAP : 07 | Blood Groups and Rh Factor | 192 |
| CHAP : 08 | Healthcare | 221 |
| CHAP : 09 | Infectious, Non-Infectious and Zoonotic Diseases | 251 |
| CHAP : 10 | Environmental and Ecological Changes | 284 |
| CHAP : 11 | Biodiversity and Sustainable Development | 314 |
| CHAP : 12 | Economic Importance of Animals and Plants | 347 |
| CHAP : 13 | Agriculture and Horticulture with Special Reference to Rajasthan | 380 |
| CHAP : 14 | Forestry and Animal Husbandry with Special Reference to Rajasthan | 412 |
| CHAP : 15 | Science and Technology Development in Rajasthan | 445 |


Click Here to Buy book on Amazon

CHAP : 16 Physical and Chemical Changes 475

CHAP : 17 Acids, Bases and Salts 508

CHAP : 18 Chemical Compounds in Everyday Use 538

**********

NODIA

# CHAPTER 01
# Information and Communication Technology

**1.** Which of the following best defines Information Technology in a modern business context?
(A) The use of hardware, software, services, and supporting infrastructure to manage and deliver information
(B) The exclusive use of computers for executing complex mathematical calculations
(C) The mechanical processing of data without the use of digital networks
(D) The study of theoretical computer science and algorithmic efficiency

**2.** Match List I with List II:
**List I: (Computer Generation)**
P. First Generation
Q. Second Generation
R. Third Generation
S. Fourth Generation
**List II: (Core Technology)**
1. Transistors
2. Microprocessors
3. Vacuum Tubes
4. Integrated Circuits
(A) P-3, Q-1, R-4, S-2
(B) P-3, Q-4, R-1, S-2
(C) P-1, Q-3, R-2, S-4
(D) P-4, Q-1, R-3, S-2

**3.** Which of the following is considered an output device used primarily to produce high-quality hard copies of large architectural or engineering drawings?
(A) Plotter
(B) Daisy-wheel printer
(C) Optical Character Reader (OCR)
(D) Flatbed Scanner

**4.** Consider the following statements regarding operating systems:
I. Linux is an open-source operating system where the source code is freely available.
II. Android is an operating system developed primarily for mobile devices, based on a modified version of the Linux kernel.
III. Microsoft Windows is a multi-user, open-source operating system widely used in enterprise servers.
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**5.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** An Internet Service Provider (ISP) is essential for a home user to connect their personal computer to the global Internet.
**Reason (R):** The ISP provides the necessary gateway, IP address routing, and infrastructure to link local networks with the broader internet backbone.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**6.** The fundamental protocol used by the World Wide Web to transfer hypermedia documents across the internet is known as:
(A) FTP (File Transfer Protocol)
(B) SMTP (Simple Mail Transfer Protocol)
(C) HTTP (Hypertext Transfer Protocol)
(D) $POP_3$ (Post Office Protocol version 3)

**7.** Consider the following statements regarding types of computer networks:
I. A Local Area Network (LAN) connects computers within a limited geographical area such as a school or office building.
II. A Wide Area Network (WAN) typically connects multiple smaller networks over a large geographical distance, such as across states or countries.
III. A Metropolitan Area Network (MAN)

Downloaded from www.pdf.tube

provides network connectivity over a larger area than a WAN but smaller than a LAN.

Which of the statements given above is/are incorrect?
(A) I only
(B) II only
(C) III only
(D) I and II only

**8.** In wireless communication, which standard is specifically associated with short-range data exchange between mobile devices, forming a Personal Area Network (PAN)?
(A) Bluetooth (IEEE 802.15.1)
(B) Wi-Fi (IEEE 802.11)
(C) WiMAX (IEEE 802.16)
(D) LTE (Long Term Evolution)

**9.** What is the primary function of a firewall in computer network security?
(A) To optimize and increase the transmission speed of local area networks by compressing data payload packets
(B) To monitor and control incoming and outgoing network traffic based on security rules
(C) To systematically search for, isolate, and remove malicious computer viruses from local storage drives
(D) To automatically encrypt all confidential data files stored permanently on local workstation hard drives

**10.** Consider the following statements regarding the Digital India programme:
I. It was launched by the Government of India in 2015.
II. One of its core vision areas is providing digital infrastructure as a core utility to every citizen.
III. It aims to eliminate all physical post offices and replace them entirely with digital kiosks.
IV. 'Digital empowerment of citizens' is among its primary objectives.

Which of the statements given above are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**11.** Which major e-Governance initiative by the Government of India provides a single platform for citizens to access pan-India e-Gov services ranging from central to local government bodies?
(A) UMANG
(B) PRAGATI
(C) SWAYAM
(D) DIKSHA

**12.** In the context of social media and Web 2.0, which of the following best describes the phenomenon of "Crowdsourcing"?
(A) The systematic deployment of automated bot networks to artificially inflate follower counts and engagement metrics on social profiles
(B) The cryptographic encryption protocol utilized by messaging applications to ensure end-to-end secure communication between users
(C) Obtaining services, ideas, or content by soliciting contributions from a large group of online users
(D) The regulatory censorship and systematic restriction of public access to online platforms by a centralized governmental authority

NODIA

**13.** Which of the following is a primary benefit of utilizing Cloud Computing for a modern business?
(A) Complete elimination of the requirement for an active high-speed internet connection to run enterprise applications
(B) Full physical ownership and local maintenance of all primary data servers within the organization's premises
(C) Complete restriction preventing external third-party software vendors from performing remote routine maintenance
(D) On-demand scalability of computing resources without major upfront capital expenditure

**14.** In Artificial Intelligence, the technique that enables a machine to automatically learn and improve from experience without being explicitly programmed for every scenario is called:
(A) Static Routing
(B) Procedural Programming
(C) Machine Learning
(D) Relational Database Management

**15.** The core characteristics often used to describe Big Data are commonly referred to as the '3Vs'. What do these stand for?
(A) Validity, Vector, Variability
(B) Volume, Velocity, Variety
(C) Value, Visibility, Volatility

(D) Virtualization, Versioning, Velocity

**16.** Blockchain technology ensures data integrity and security primarily through which of the following mechanisms?
(A) Maintaining and synchronizing all transaction records exclusively on a single, secure, centralized government server
(B) Automatically purging and permanently erasing historical transaction data logs at scheduled twenty-four-hour intervals
(C) Mandating a verified physical handwritten signature from authorized administrators for every digital block created
(D) Utilizing cryptographic hashing and a decentralized, distributed ledger network

**17.** Arrange the following milestones in India's mobile and telecom revolution in chronological order from earliest to latest:
I. Establishment of the Telecom Regulatory Authority of India (TRAI)
II. Launch of the first commercial cellular mobile service in India
III. Implementation of Mobile Number Portability (MNP) nationwide
IV. Launch of commercial 5G services in India
Select the correct order:
(A) II, I, III, IV
(B) I, II, III, IV
(C) II, III, I, IV
(D) I, III, II, IV

**18.** The BharatNet project primarily aims to achieve which of the following objectives?
(A) To distribute subsidized smartphone devices to all low-income rural households living below the official poverty line
(B) To deploy dedicated geo-stationary telecommunication satellites designed specifically for real-time disaster management
(C) To connect Gram Panchayats across India with high-speed optical fibre broadband
(D) To set up a centralized national network of advanced cyber security emergency response centres in major urban cities

**19.** Under the Information Technology Act, 2000 of India, Section 66 deals primarily with offenses related to:
(A) Computer related offences, including hacking and unauthorized access
(B) Electronic signature certificates
(C) The procedural appointment of the Controller of Certifying Authorities
(D) Regulations regarding the taxation of e-commerce transactions

**20.** Which of the following represents the correct sequential order of evolution (from earliest launched to most recently launched) of these electronic payment systems in India?
(A) IMPS → NEFT → UPI → RTGS
(B) NEFT → RTGS → IMPS → UPI
(C) RTGS → NEFT → UPI → IMPS
(D) UPI → IMPS → NEFT → RTGS

**21.** Which organization is the premier trade body and chamber of commerce for the Tech industry in India, heavily contributing to IT policy advocacy?
(A) NITI Aayog
(B) NASSCOM
(C) FICCI
(D) TRAI

**22.** What is the primary purpose of setting up Software Technology Parks of India (STPI) by the Ministry of Electronics and Information Technology?
(A) To manufacture hardware components like silicon chips for import substitution
(B) To train primary school teachers in basic computer literacy
(C) To promote and facilitate the export of software from India
(D) To regulate the pricing of commercial software sold in the domestic market

**23.** In the context of Rajasthan's IT policy and infrastructure, which major initiative is designed to foster entrepreneurship and support startups across the state?
(A) e-Mitra
(B) RajNET
(C) Bhamashah Yojana
(D) iStart Rajasthan

**24.** How does the integration of Information Technology primarily support the Right to Information (RTI) Act in India?
(A) By enabling online RTI filing and proactive digital data disclosure
(B) By completely eliminating the administrative necessity and statutory authority of an Information Commissioner
(C) By allowing government agencies to heavily encrypt all public administrative records to

Click Here to Buy book on Flipkart

restrict citizen access
(D) By imposing strict financial penalties on citizens requesting physical copies of public documents instead of digital files

**25.** Geographic Information System (GIS) technology relies fundamentally on which of the following to function effectively?
(A) Complex algorithmic data generated from social media user engagement profiles
(B) Spatial and geographic data linked to digital maps
(C) Decentralized transaction logs maintained on distributed blockchain ledger entries
(D) Continuous analog voice signal transmission routed over legacy copper wire networks

**26.** In the context of the Internet of Things (IoT), what is the specific role of an 'actuator'?
(A) It securely encrypts outbound telemetry data payload prior to transmission to remote cloud servers
(B) It converts electrical input into physical action based on system commands
(C) It provides uninterrupted power supply to central routing and switching devices in local networks
(D) It operates as a network firewall to automatically filter and block malicious incoming web traffic

**27.** Under the Digital Personal Data Protection Act, 2023 of India, what is the term used for the individual to whom the personal data relates?
(A) Data Principal
(B) Data Fiduciary
(C) Data Processor
(D) Data Auditor

**28.** Consider the following statements regarding the application areas of Information Technology:
I. In the healthcare sector, IT enables electronic health records (EHR) and telemedicine.
II. In the financial sector, IT completely eliminates the need for any regulatory oversight.
III. In education, IT facilitates Learning Management Systems (LMS) and Massive Open Online Courses (MOOCs).
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**29.** Which generation of computers saw the shift from magnetic drum memory to magnetic core memory, along with the introduction of high-level programming languages like FORTRAN and COBOL?
(A) First Generation
(B) Second Generation
(C) Third Generation
(D) Fourth Generation

**30.** Which component is considered the "brain" of a computer, responsible for executing instructions of a computer program by performing basic arithmetic, logic, controlling, and input/output operations?
(A) High-speed volatile Random Access Memory (RAM)
(B) Non-volatile magnetic Hard Disk Drive (HDD)
(C) Central Processing Unit (CPU)
(D) Main system printed circuit Motherboard

**31.** Match List I with List II:
**List I: (Type of Software)**
P. Operating System
Q. Application Software
R. Utility Program
S. Web Browser
**List II: (Example)**
1. Microsoft Word
2. Antivirus
3. Linux
4. Google Chrome
(A) P-3, Q-1, R-2, S-4
(B) P-3, Q-2, R-1, S-4
(C) P-1, Q-3, R-4, S-2
(D) P-4, Q-1, R-2, S-3

**32.** Which of the following defines the function of a Domain Name System (DNS) in the working of the Internet?
(A) It dynamically assigns temporary physical MAC addresses to network interface hardware devices
(B) It operates as an automated web crawling engine to index online hypermedia content for searches
(C) It implements secure end-to-end cryptographic encryption protocols for confidential email exchanges
(D) It translates domain names into IP addresses for data routing

Downloaded from www.pdf.tube

**33.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The World Wide Web (WWW) and the Internet are not synonymous terms.
**Reason (R):** The Internet is a global network of interconnected computer networks, whereas the WWW is an information system of linked hypertext documents accessed over the Internet.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**34.** What does the acronym Ethernet most commonly refer to in the context of networking?
(A) The primary standardized wireless communication protocol utilized across modern high-speed 5G mobile networks
(B) An enterprise-grade distributed cloud computing storage management protocol
(C) A technology for connecting devices in a wired Local Area Network (LAN)
(D) A malicious software payload designed to self-replicate and spread through unsolicited email attachments

**35.** Consider the following statements regarding wireless communication technologies:
I. Wi-Fi operates based on the IEEE 802.11 family of standards.
II. 5G networks promise lower latency compared to 4G networks.
III. Bluetooth is typically used for long-distance communication spanning several kilometers.
IV. 4G uses LTE (Long Term Evolution) technology to deliver mobile broadband.
Which of the statements given above are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**36.** A malicious software that locks a user's files through encryption and demands payment to restore access is known as:
(A) Spyware
(B) Adware
(C) Rootkit
(D) Ransomware

NODIA

**37.** Which of the following is NOT one of the nine pillars of the Digital India programme?
(A) Broadband Highways
(B) Mandatory Cryptocurrency Adoption
(C) Universal Access to Mobile Connectivity
(D) E-Kranti - Electronic Delivery of Services

**38.** Arrange the following e-Governance initiatives of India in chronological order from earliest to latest launch year:
I. Common Service Centres (CSC) scheme approval
II. Launch of the UMANG mobile application
III. Launch of the National e-Governance Plan (NeGP)
IV. Launch of the CoWIN platform
Select the correct order:
(A) III, I, II, IV
(B) I, III, II, IV
(C) III, II, I, IV
(D) I, II, III, IV

**39.** In the context of social media's socio-economic impact, the term 'Digital Divide' primarily refers to:
(A) The physical infrastructure divide characterized by unequal distribution of high-speed telecommunication cables between rural and urban municipal borders
(B) The structural separation and operational divide existing between hardware component manufacturing firms and application software development enterprises
(C) The perimeter security boundary and firewall encryption protocols that isolate internal corporate private networks from public internet infrastructure
(D) The disparity between groups with access to modern information technology and those without

**40.** In Cloud Computing, when a vendor provides a complete software application accessible via a web browser on a subscription basis, the service model is known as:
(A) Software as a Service (SaaS)
(B) Infrastructure as a Service (IaaS)
(C) Platform as a Service (PaaS)
(D) Network as a Service (NaaS)

**41.** Which subset of Artificial Intelligence utilizes multi-layered artificial neural networks to learn from vast amounts of unstructured data, commonly used in image and speech recognition?

(A) Procedural generation
(B) Deep Learning
(C) Expert systems with static rules
(D) Linear regression optimization

**42.** In Big Data analytics, the process of discovering hidden patterns, market trends, and unknown correlations from massive data sets is generally termed as:
(A) Data Masking
(B) Data Mining
(C) Data Encapsulation
(D) Data Archiving

**43.** A defining feature of a cryptocurrency like Bitcoin is that it operates independently of a central bank. How are transactions verified and recorded?
(A) Through distributed computer nodes using cryptographic proofs on a blockchain
(B) By physical paper ledgers compiled and stored securely at international central banking consortium headquarters
(C) By a centralized server cluster owned, maintained, and operated directly by the commercial Bitcoin Corporation
(D) Through the World Bank's automated global clearinghouse and international financial settlement system

**44.** The Centre for Development of Telematics (C-DOT) in India was established primarily for what purpose?
(A) To regulate the tariffs of private cellular operators
(B) To act as a commercial mobile network operator competing with private brands
(C) To design and develop indigenous telecom technology and digital exchanges
(D) To auction the radio frequency spectrum to telecom providers

**45.** The BharatNet project was formerly known by which of the following names?
(A) National Telecom Grid Infrastructure Project (NTG)
(B) Integrated Gramin Sanchar Sewa Network (GSS)
(C) Comprehensive Rural Broadband Initiative (RBI)
(D) National Optical Fibre Network (NOFN)

**46.** Which of the following represents the correct sequential steps typically followed in a Data Analytics lifecycle?
(A) Data Preparation → Data Discovery → Model Building → Model Evaluation
(B) Data Discovery → Data Preparation → Model Building → Model Evaluation
(C) Model Building → Data Discovery → Data Preparation → Model Evaluation
(D) Data Evaluation → Model Building → Data Preparation → Data Discovery

**47.** In the context of digital payment systems in India, RTGS is meant for high-value transactions. What is the minimum transaction limit for remitting funds through RTGS?
(A) ₹50,000
(B) ₹1,00,000
(C) ₹2,00,000
(D) There is no minimum limit

**48.** The term Business Process Outsourcing (BPO) is closely associated with India's IT sector growth. What does it primarily entail?
(A) Exporting physical IT hardware, peripheral components, and computer monitors to foreign consumer markets
(B) The systematic international migration of foreign software professionals to India for permanent commercial employment
(C) State and central government departments outsourcing public policy formulation and drafting to private technology firms
(D) Contracting standard business operations to third-party service providers

**49.** Which entity provides statutory status and administrative oversight to the Software Technology Parks of India (STPI)?
(A) Ministry of Electronics and Information Technology
(B) Union Ministry of Commerce and Industry of India
(C) Department of Expenditure, Ministry of Finance
(D) National Institution for Transforming India (NITI Aayog)

**50.** In Rajasthan, the flagship e-Governance initiative that serves as a unified service delivery platform offering a single window for various G2C (Government to Citizen) and $B_2C$ services is:
(A) RajKaaj

Click Here to Buy book on Amazon

(B) Sampark
(C) e-Mitra
(D) RajDhārā

**51.** According to Section 4 of the Right to Information Act, 2005, public authorities are mandated to maintain and publish records in a manner that facilitates the right to information. This is best supported by which IT practice?
(A) Implementing proactive digital disclosure on public web portals
(B) Mandating the use of proprietary, closed-source commercial software exclusively across all daily government tasks
(C) Strictly restricting official government websites to function only within secure intra-departmental local networks
(D) Systematically encrypting all official public notices and routine administrative circulars to prevent unauthorized reading

**52.** The Indian regional navigation satellite system developed by ISRO, which plays a critical role in domestic GIS applications and location-based services, is named:
(A) GAGAN
(B) Bhuvan
(C) VEDAS
(D) NavIC

**53.** Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes. Which of the following is a classic example of a CPS?
(A) A standalone desktop application for offline word processing and document editing
(B) A smart grid managing electricity distribution from real-time data
(C) A simple static HTML webpage hosting unformatted historical text documentation
(D) A fully mechanical wristwatch operating without digital components or sensors

**54.** Under the prevailing guidelines regarding data localization and protection in India, a "Data Fiduciary" is defined as:
(A) Any service provider or contractor that exclusively provides technical cloud infrastructure without accessing stored information
(B) The specialized central government judicial authority tasked with adjudicating and penalizing financial cyber crimes
(C) The entity that determines the purpose and means of processing personal data
(D) The natural individual citizen whose personal identification records and data are being collected and stored

**55.** Which of the following best highlights the impact of Information Technology on the logistics and supply chain industry?
(A) Complete structural elimination of the physical operational requirement for heavy goods transportation vehicles
(B) A substantial increase in manual paper-based record-keeping protocols across primary warehouse storage facilities
(C) A severe reduction in the analytical ability of commercial enterprises to accurately predict consumer market demand
(D) Real-time tracking of goods via GPS and automated inventory management

NODIA

**56.** Consider the following statements regarding the generations of computers:
I. First-generation computers used vacuum tubes and were characterized by massive size and high heat generation.
II. Second-generation computers replaced vacuum tubes with transistors, making them smaller and more reliable.
III. Fifth-generation computers are strictly based on mechanical relays and do not utilize parallel processing.
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**57.** Which type of memory is volatile, meaning it loses its stored data as soon as the power is turned off?
(A) Read-Only Memory module (ROM)
(B) Random Access Memory (RAM)
(C) Magnetic Hard Disk Drive (HDD)
(D) Non-volatile Solid State Drive (SSD)

**58.** An operating system performs several core functions. Which of the following is NOT typically a function of an operating system?
(A) Allocating dynamic physical and virtual system RAM memory management
(B) Compiling high-level programming code into machine code
(C) Processor time allocation and task execution process scheduling

(D) Storage partitioning, file directory organisation, and disk management

**59.** When a user types a website URL into a browser, which protocol typically handles the secure transmission of the webpage data from the web server to the client's browser?
(A) HTTPS
(B) HTTP Protocol
(C) FTP Protocol
(D) IMAP Protocol

**60.** Who is widely credited with the invention of the World Wide Web in 1989?
(A) Vinton Gray Cerf
(B) William Henry Gates
(C) Tim Berners-Lee
(D) Steven Paul Jobs

**61.** Match List I with List II:
**List I: (Network Topology)**
P. Star Topology
Q. Ring Topology
R. Bus Topology
S. Mesh Topology
**List II: (Key Characteristic)**
1. All devices connected to a single central cable
2. Every device is connected to every other device
3. All devices connected to a central hub/ switch
4. Each device is connected to exactly two other devices forming a circular pathway

(A) P-3, Q-4, R-1, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-1, Q-4, R-3, S-2
(D) P-2, Q-4, R-1, S-3

**62.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Wi-Fi networks typically use the 2.4 GHz and 5 GHz frequency bands for transmitting data.
**Reason (R):** The 5 GHz band generally provides faster data rates at a shorter distance, while the 2.4 GHz band provides better coverage but at slower speeds.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**63.** A type of cyber attack where a fraudulent email is sent pretending to be from a reputable source in order to trick the recipient into revealing sensitive data like passwords is known as:
(A) Denial of Service (DoS)
(B) Phishing
(C) SQL Injection
(D) Man-in-the-Middle attack

**64.** The 'Digital India' programme integrates which earlier overarching national e-governance initiative to revamp it into a comprehensive vision?
(A) Comprehensive National Informatics Policy Framework
(B) Integrated Rural e-Panchayat Mission Scheme
(C) Swachh Bharat Digital Governance Initiative
(D) National e-Governance Plan (NeGP)

**65.** Consider the following statements regarding the UMANG application:
I. It stands for Unified Mobile Application for New-age Governance.
II. It allows citizens to access Employees' Provident Fund Organization (EPFO) services.
III. It only provides services offered by the Central Government, completely excluding State Government services.
IV. It supports multiple Indian languages to ensure wider accessibility.
Which of the statements given above are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**66.** In the context of social media networks, what does the term 'Algorithm' generally refer to?
(A) The physical central server arrays designed specifically for storing user profile images and media
(B) The international legal framework and regulatory copyright laws governing content enforcement on videos
(C) Mathematical rules used to determine displayed content
(D) The end-to-end cryptographic encryption protocol utilized exclusively for private user messaging services

Downloaded from www.pdf.tube

**67.** Which deployment model of cloud computing provides infrastructure exclusively for a single organization, ensuring higher security and privacy control?
(A) Private Cloud
(B) Public Cloud
(C) Community Cloud
(D) Hybrid Cloud

**68.** The "Turing Test," originally proposed by Alan Turing, is primarily associated with which field of technology?
(A) Benchmark testing and assessing the clock processing speed of a microchip
(B) Measuring the maximum redundant data storage capacity of cloud data centers
(C) Determining the cryptographic security strength and hash resistance of a blockchain
(D) Evaluating a machine's ability to exhibit human-like intelligence

**69.** Arrange the following big data processing frameworks/tools in the general order of their historical emergence in the industry:
I. Relational Database Management Systems (RDBMS) dominance
II. Introduction of Hadoop framework (MapReduce)
III. Widespread adoption of real-time stream processing tools like Apache Kafka / Spark Streaming
Select the correct order:
(A) I, II, III
(B) II, I, III
(C) I, III, II
(D) III, II, I

**70.** In Blockchain technology, what is the purpose of a "Hash"?
(A) To precisely identify the physical geographic location and IP address of an individual network miner
(B) To automatically convert and translate digital cryptocurrency units into fiat physical currency
(C) To act as a unique digital fingerprint verifying block data integrity
(D) To systematically purge and delete old historical transactions from the distributed network ledger

**71.** The historic New Telecom Policy (NTP) that significantly liberalized the Indian telecommunication sector and shifted it from a license fee regime to a revenue-sharing model was introduced in which year?
(A) 1991
(B) 1999
(C) 2004
(D) 2012

**72.** Who is the implementing agency responsible for the execution of the BharatNet project?
(A) Bharat Broadband Network Limited (BBNL)
(B) Reliance Jio Infocomm
(C) Telecom Regulatory Authority of India (TRAI)
(D) National Informatics Centre (NIC)

**73.** Which specific section of the Information Technology Act, 2000 prescribes punishment for publishing or transmitting obscene material in electronic form?
(A) Section 43
(B) Section 65
(C) Section 66C
(D) Section 67

NODIA

**74.** In the Unified Payments Interface (UPI) system, a Virtual Payment Address (VPA) functions as:
(A) A complex, encrypted multi-factor authorization password required to access account settings on a mobile banking application
(B) A unique identifier mapping to a user's bank account for transfers
(C) The dedicated static IP address assigned to the commercial bank's primary core transaction processing server
(D) A statutory regulatory compliance code issued to merchant vendors by the Reserve Bank of India oversight committee

**75.** Which of the following represents the correct order of Cloud Service Models, from the one offering the user the most control over the IT resources to the one offering the least control?
(A) SaaS → PaaS → IaaS
(B) IaaS → PaaS → SaaS
(C) PaaS → IaaS → SaaS
(D) IaaS → SaaS → PaaS

**76.** The economic contribution of the IT industry to India's GDP has grown significantly. A major component of this revenue comes from IT-BPM exports. What does BPM stand for?
(A) Broadband Performance Metrics
(B) Base Processing Module

(C) Business Process Management
(D) Bureau of Public Maintenance

**77.** The centralized grievance redressal platform of the Government of Rajasthan, which extensively uses IT to register and track citizen complaints, is known as:
(A) Integrated e-Sanchar Portal
(B) State RajKaaj System
(C) Digital e-Dharti Network
(D) Rajasthan Sampark

**78.** In the RTI online portal system, once a citizen submits a request, the request is typically routed directly to which designated official in the concerned department?
(A) Chief Information Commissioner (CIC)
(B) District Magistrate (DM)
(C) Public Information Officer (PIO)
(D) Network Administrator

**79.** In Remote Sensing technology, passive sensors differ from active sensors because passive sensors:
(A) Actively generate and emit their own focused electromagnetic radiation energy beams to illuminate the observed ground target
(B) Detect naturally available energy, such as reflected sunlight
(C) Operating in specialized radio bands, can easily penetrate dense cloud cover and heavy rainfall under any weather conditions
(D) Are acoustic instrumentation systems strictly deployed for deep-sea oceanic mapping and bathymetric sonar profiling

**80.** The protocol most crucial for the expansion of the Internet of Things (IoT), providing a vastly larger address space for billions of connected devices, is:
(A) IPv4
(B) SMTP
(C) FTP
(D) IPv6

**81.** Under the Indian data protection framework, what is the role of a "Data Processor"?
(A) An entity processing personal data on behalf of a Data Fiduciary
(B) The individual natural person citizen whose personal identification data is being collected and recorded
(C) The statutory central government administrative authority that sets national data privacy regulations and policies
(D) The primary cloud data server architecture maintained directly by the central government oversight agency

**82.** E-commerce is a prominent application of IT. The model where a consumer sells products or services directly to another consumer using an online platform (like OLX or eBay) is termed:
(A) $B_2B$ (Business-to-Business)
(B) $B_2C$ (Business-to-Consumer)
(C) $C_2C$ (Consumer-to-Consumer)
(D) $C_2B$ (Consumer-to-Business)

**83.** The ENIAC and UNIVAC are classic examples of which generation of computers?
(A) First Generation
(B) Second Generation
(C) Third Generation
(D) Fourth Generation

**84.** Consider the following statements regarding basic hardware components:
I. A scanner is classified as an input device.
II. A motherboard acts as the main circuit board that connects the CPU, memory, and peripheral devices.
III. A monitor is universally classified as an input device.
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**85.** Which of the following is a characteristic feature of a 'Multitasking' operating system?
(A) It permits only a single application to be loaded into memory at any one time.
(B) It allows a user to execute more than one program simultaneously.
(C) It requires multiple separate physical processors to function.
(D) It does not support a graphical user interface (GUI).

**86.** In the context of the Internet, what is a "Browser"?
(A) A physical hardware modem device that modulates incoming analog telecommunication signals into digital computer data
(B) The dedicated physical web server host facility where hypermedia web pages and databases are permanently stored

Click Here to Buy book on Flipkart

(C) A software application used to retrieve and display Web content
(D) An automated antivirus firewall security tool designed to block unauthorized incoming local network access attempts

**87.** A standard Uniform Resource Locator (URL) usually consists of a protocol, domain name, and path. In the URL "https://www.rajasthan.gov.in/index.html", what does "gov.in" signify?
(A) The exact server directory path specifying the local file being accessed
(B) The underlying secure network transmission protocol mechanism
(C) The internal local area network host node identification address
(D) The Top-Level Domain indicating an Indian government website

**88.** A network device that connects multiple networks together and directs data packets to their correct destination based on IP addresses is called a:
(A) Router
(B) Hub
(C) Switch
(D) Repeater

**89.** Which generation of mobile telecommunication technology introduced the concept of packet-switched mobile data networks (mobile broadband) paving the way for smartphone app ecosystems, commonly associated with the HSPA standard?
(A) 1G
(B) 2G
(C) 3G
(D) 4G

**90.** Match List I with List II:
**List I: (Cyber Security Term)**
P. Trojan Horse
Q. Worm
R. Keylogger
S. DDoS Attack
**List II: (Definition)**
1. Software that records keystrokes to steal passwords
2. Overwhelming a server with traffic to render it unavailable
3. Malware disguised as legitimate software
4. Self-replicating malware that spreads across networks without human action

(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-4, R-2, S-1
(D) P-1, Q-2, R-3, S-4

**91.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Digital signature certificates are heavily promoted under the Digital India campaign for e-Governance services.
**Reason (R):** Digital signatures ensure the authenticity of the sender and the integrity of the electronic document, providing legal non-repudiation.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**92.** The Government of India initiative designed to provide citizen-centric services like bill payments, passport applications, and agricultural information primarily in rural areas through local entrepreneurs is called:
(A) Make in India National Manufacturing Initiative
(B) Aatmanirbhar Bharat Self-Reliant Campaign
(C) Common Service Centres (CSC)
(D) Smart Cities Mission Urban Infrastructure Scheme

**93.** A potential negative socio-economic impact of unregulated social media use includes the creation of "Echo Chambers." What does this term imply?
(A) An audio signal feedback loop and hardware distortion malfunction occurring during real-time Voice over IP communication calls
(B) A commercial billing structure where online social media platforms charge registered users based directly on data usage volume
(C) An emergency governmental broadcast system designed to push urgent safety notifications to personal mobile devices
(D) An environment reinforcing existing user opinions without opposing views

**94.** In cloud computing terminology, what does "Elasticity" refer to?
(A) The structural durability and physical bend radius flexibility of high-speed fiber optic cables deployed in server data centers
(B) The contractual variability and legal

NODIA

flexibility of standardized cloud vendor service agreements regarding customer data ownership
(C) Automated provisioning and de-provisioning of cloud resources based on demand
(D) The operational capability of managed cloud server infrastructure to automatically mitigate and suppress distributed cyber attacks

**95.** Consider the following statements regarding Artificial Intelligence and Machine Learning:
I. Supervised learning requires training data to be labeled with the correct output.
II. Unsupervised learning algorithm tries to find hidden structures in unlabeled data.
III. Natural Language Processing (NLP) is a branch of AI that enables machines to understand and interpret human language.
IV. Machine Learning completely eliminates the need for any mathematical algorithms.
Which of the statements given above are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I, III and IV

**96.** Apache Hadoop is a popular open-source framework associated with Big Data. Which of its core components is specifically responsible for distributed storage of massive datasets?
(A) MapReduce Distributed Processing Framework
(B) YARN Resource Management Engine
(C) Apache Hive Data Warehouse Software
(D) HDFS (Hadoop Distributed File System)

**97.** The process by which new blocks are added to a blockchain through solving complex mathematical puzzles, commonly used in networks like Bitcoin, is known as:
(A) Mining
(B) Web Scraping
(C) Packet Sniffing
(D) Virtualization

**98.** Which government body in India is tasked with the regulation of telecom services, including fixing or revising tariffs, to ensure fair competition and protect consumer interests?
(A) Centre for Development of Advanced Computing (C-DAC)
(B) Indian Space Research Organisation (ISRO)
(C) TRAI (Telecom Regulatory Authority of India)
(D) National Association of Software and Service Companies (NASSCOM)

**99.** The optical fibre cable laid under the BharatNet project relies on which physical principle to transmit data as light signals?
(A) Total internal reflection
(B) Electromagnetic induction
(C) Thermoelectric effect
(D) Piezoelectric effect

**100.** In India's legal framework, the Information Technology Act was originally passed by the Parliament in which year?
(A) 1995
(B) 2000
(C) 2005
(D) 2010

**101.** NEFT (National Electronic Funds Transfer) processes transactions differently from RTGS. How does NEFT primarily settle transactions?
(A) In real-time on a one-to-one basis immediately
(B) In half-hourly batches throughout the day
(C) Only once at midnight every day
(D) Physically through the dispatch of postal cheques

**102.** The IT and ITES (IT Enabled Services) sector in India has been a major generator of employment. Which of the following best defines ITES?
(A) The high-tech industrial manufacturing, processing, and assembly of silicon wafers utilized in semiconductor microchips
(B) The brick-and-mortar retail sale and distribution of personal computer hardware and consumer electronics in shopping centers
(C) Technology-driven operational services such as BPOs and call centers
(D) The commercial real estate development and physical construction of modern technology park buildings and infrastructure

**103.** Software Technology Parks of India (STPI) offers which of the following key benefits to registered software export units?
(A) Statutory guarantee for the direct procurement and purchase of all proprietary software products by the central Indian government
(B) Mandatory free deployment of qualified software developers directly from state-funded technical universities to private firms

NODIA

(C) Full statutory immunity and complete exemption from national and state commercial labour laws
(D) Duty-free hardware imports and export tax incentives

**104.** The Government of Rajasthan uses the 'Bhamashah Yojana' (later evolved into Jan Aadhaar) primarily for which purpose?
(A) Direct Benefit Transfer (DBT) and financial inclusion
(B) To electronically process, issue, and renew commercial driving licenses and vehicle registration certificates across state transport offices
(C) Monitoring and tracking real-time meteorological weather fluctuations and rainfall forecasts for local agricultural farmers
(D) Implementing state-funded social welfare schemes to provide free portable laptop computers to eligible undergraduate university students

**105.** Under proactive disclosure in the RTI framework, an organization's official website should ideally contain which of the following?
(A) System administrative credentials and security passwords of all active government employee departmental email accounts
(B) Organizational structure details and officer duties
(C) Highly sensitive personal health files and private medical diagnosis records of the sitting Chief Minister and cabinet ministers
(D) Unreleased strategic drafts, tactical planning documentation, and classified operational details concerning national military defense

**106.** In GIS mapping, spatial data is generally represented in two primary formats. What are they?
(A) Audio and Video
(B) Vector and Raster
(C) Hexadecimal and Binary
(D) Analog and Digital

**107.** Which of the following is a common security concern associated with the Internet of Things (IoT)?
(A) Weak default passwords and lack of security updates on many IoT devices
(B) Embedded IoT microchips consistently generate excessive thermal heat during operation, posing severe physical fire hazards
(C) Standardized IoT communications protocols strictly prohibit any form of remote network access, completely isolating end users
(D) Hardware limitations prevent consumer IoT sensor devices from establishing wireless connections with standard Wi-Fi router networks

**108.** The principle of 'Data Minimization' in modern data protection policies dictates that:
(A) Commercial organizations are legally mandated to compress and reduce the physical disk storage size of stored user data files
(B) Individual citizens are systematically restricted from uploading high-capacity digital files onto official public government web portals
(C) Collecting only personal data strictly necessary for a specified purpose
(D) Centralized government administrative databases are mandated to automatically purge and erase all personal citizen data annually

**109.** Which technological trend has most heavily facilitated the transition of businesses to remote work and remote collaboration environments?
(A) Legacy manual analog telephone switching exchanges
(B) First-generation vacuum tube electronic computing architectures
(C) Traditional offline standalone desktop software application programs
(D) Cloud collaboration tools and high-speed internet

**110.** Which computer generation introduced the concept of time-sharing operating systems and saw the invention of the computer mouse?
(A) First Generation
(B) Second Generation
(C) Third Generation
(D) Fourth Generation

**111.** Which piece of utility software is designed to reorganize fragmented files on a magnetic hard drive so they are stored in contiguous sectors, thereby improving read/write speed?
(A) Antivirus Scanner
(B) Disk Defragmenter
(C) Web Browser
(D) Compiler

Downloaded from www.pdf.tube

**112.** An operating system is considered an interface between:
(A) The visual output display monitor device and the physical peripheral input keyboard
(B) The global wide area public internet connection and the local network routing gateway device
(C) The central relational database storage software and the local hardcopy document printer device
(D) Computer hardware and end-user application software

**113.** Consider the following statements about Web Browsers and Search Engines:
I. A Web Browser is a software application used to retrieve and present information on the Web (e.g., Firefox).
II. A Search Engine is a web-based tool that searches for specific information within a database based on keywords (e.g., Google Search).
III. A Web Browser and a Search Engine are exactly the same technological entity.
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**114.** The 's' in HTTPS stands for:
(A) System
(B) Synchronous
(C) Secure
(D) Standard

**115.** An organization spanning across multiple branch offices in different cities within a country would typically connect its local networks using a:
(A) Wide Area Network (WAN)
(B) Local Area Network (LAN)
(C) Personal Area Network (PAN)
(D) Storage Area Network (SAN)

**116.** Which specific cellular network technology is heavily characterized by 'Massive MIMO' (Multiple Input Multiple Output) antennas and millimeter wave (mmWave) spectrum to achieve high speeds?
(A) 2G GSM
(B) 3G UMTS
(C) 5G NR
(D) Bluetooth

**117.** A 'Zero-Day' vulnerability refers to:
(A) An optimized enterprise telecommunications network architecture engineered to consistently operate with absolute zero operational downtime
(B) A software flaw unknown to the vendor and actively exploited by attackers
(C) A destructive malicious computer virus payload designed to systematically and completely purge all hard drive data within twenty-four hours
(D) An advanced real-time endpoint antivirus protection software suite designed to identify and isolate security threats immediately upon execution

**118.** Which pillar of the Digital India programme focuses on leveraging IT to improve government processes and service delivery by simplifying forms, integrating services, and utilizing online platforms?
(A) Comprehensive Nationwide Public Internet Access Programme Initiative
(B) Universal Access to Mobile Telecommunication Connectivity Infrastructure
(C) e-Governance: Reforming Government through Technology
(D) National Information Technology Employment Skills Training for Jobs

**119.** Match List I with List II:
**List I: (GoI Digital Initiative)**
P. DigiLocker
Q. e-Hospital
R. e-NAM
S. SWAYAM
**List II: (Core Purpose)**
1. Online registration and appointment in government hospitals
2. Secure cloud-based platform for storing documents
3. Massive open online courses (MOOC) platform
4. Pan-India electronic trading portal for agricultural commodities
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**120.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Microblogging platforms like X

NODIA

(formerly Twitter) impose a character limit on posts.

**Reason (R):** The character limit encourages concise communication, real-time news sharing, and fast consumption of information.

(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**121.** Server Virtualization is a foundational technology for Cloud Computing. What does it achieve?
(A) It permanently welds and links internal processing hardware across multiple physical server chassis into a single monolithic server box
(B) It lets multiple virtual servers run on one physical server to maximize usage
(C) It transforms physical enterprise rack servers directly into immersive virtual reality interface headsets for system administrators
(D) It physically relocates heavy data center server hardware units between different regional geographic facility locations dynamically

**122.** In the context of Artificial Intelligence, a "Chatbot" deployed on a customer service website most heavily relies on which technology to parse user queries?
(A) Computer Vision
(B) Natural Language Processing (NLP)
(C) Robotics
(D) Optical Character Recognition (OCR)

**123.** The 'Velocity' characteristic in Big Data refers to:
(A) The speed of data generation, processing, and real-time analysis
(B) The physical rotational read-write speed of magnetic enterprise hard disk drives utilized to store information
(C) The operational frequency and scheduled rate at which routine software maintenance updates are deployed
(D) The maximum network bandwidth and transfer speed of the broadband internet connection utilized by end-users

**124.** What is a "Smart Contract" in the context of Blockchain technology?
(A) A traditional paper-based, legally binding commercial agreement physically witnessed and stamped by a certified public notary
(B) A standardized enterprise service-level agreement for cloud computing services featuring dynamic real-time resource pricing
(C) A self-executing contract encoded directly onto a blockchain
(D) An artificial intelligence machine learning model designed to generate complex commercial legal contracts completely automatically

**125.** The introduction of Mobile Number Portability (MNP) in the Indian telecom sector allowed subscribers to:
(A) Physically detach and transport their fixed landline telephone instrument anywhere across national borders
(B) Directly convert and re-register their primary personal cellular telephone numbers into official bank account numbers
(C) Receive permanent, unrestricted access to make unlimited free voice calls across all domestic competing telecom networks
(D) Retain their mobile number when switching telecom operators

**126.** Consider the following statements regarding the BharatNet project:
I. It is funded by the Universal Service Obligation Fund (USOF).
II. It aims to provide a minimum of 100 Mbps broadband connectivity to all Gram Panchayats.
III. It only provides wired connectivity, prohibiting the use of satellite or radio links in difficult terrains.
IV. State governments and private telecom operators can utilize the BharatNet infrastructure to provide services to rural citizens.

Which of the statements given above are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I, III and IV

**127.** Under the IT Act 2000, unauthorized downloading, copying, or extracting of data from an individual's computer without their permission attracts civil liability and penalties under which section?
(A) Section 43
(B) Section 66F

Click Here to Buy book on Amazon

(C) Section 67
(D) Section 72

**128.** National Payments Corporation of India (NPCI) is an umbrella organization for operating retail payments and settlement systems in India. It is an initiative of:
(A) National Institution for Transforming India (NITI Aayog) and the Union Ministry of Finance
(B) State Bank of India along with the Union Ministry of Electronics and Information Technology
(C) Securities and Exchange Board of India (SEBI) and the Bombay Stock Exchange Oversight Committee
(D) Reserve Bank of India (RBI) and Indian Banks' Association (IBA)

**129.** The growth of IT parks in India was catalysed by the creation of Special Economic Zones (SEZs). What primary fiscal benefit is offered to IT companies operating within an SEZ?
(A) Income tax holidays and statutory indirect tax exemptions
(B) Direct monthly monetary cash subsidies provided by the central government to assist with paying baseline employee software engineering salaries
(C) Unconditional and complete statutory exemption from paying municipal commercial utility bills including high-voltage electricity and industrial water supplies
(D) Full legal immunity and protection from the jurisdiction of national corporate criminal laws and corporate financial regulatory compliance mandates

**130.** The Software Technology Parks of India (STPI) scheme was initiated in 1991. What was the global economic context in India at that time?
(A) India implemented a strict legislative ban on all international software exports to protect fragile domestic computing service industries
(B) India declared a absolute economic embargo on foreign hardware imports, attempting to forcibly foster an entirely self-reliant pure software economy
(C) India was undergoing economic liberalization to boost foreign exchange through exports
(D) India passed emergency legislation nationalizing all existing private IT development companies into state-owned public sector enterprises

**131.** Mahindra World City in Jaipur is highly significant to the state's economy primarily because it is:
(A) A Special Economic Zone (SEZ) housing major IT/ITES companies
(B) The single largest centralized wholesale agricultural produce market yard (mandi) in the entire Asian continent
(C) The primary executive administrative headquarters complex of the state-owned Rajasthan State Road Transport Corporation
(D) A heavily industrial manufacturing facility site designated exclusively for large-scale structural steel processing and fabrication

**132.** The concept of "e-Governance" directly supports the Right to Information by:
(A) Formally classifying the personal identity and contact details of the designated departmental public information officer as a protected state secret
(B) Routinely purging and permanently deleting all public administrative records older than five years to conserve server storage space capacity
(C) Strictly restricting all electronic administrative database access rights exclusively to senior cabinet ministers and executive officials
(D) Digitizing records to prevent tampering and enable rapid retrieval

NODIA

**133.** The GPS (Global Positioning System) used worldwide for spatial location and navigation is owned and operated by the government of which country?
(A) Russian Federation
(B) United States of America
(C) People's Republic of China
(D) The European Union

**134.** In an Internet of Things (IoT) ecosystem, what is the function of a "Gateway"?
(A) It refers exclusively to a reinforced physical access door guarding the entrance of a high-security server data center facility
(B) It functions as an automated database cleanup tool that periodically purges and deletes duplicate telemetry records on remote cloud servers
(C) It connects IoT devices to the cloud, providing local processing and security
(D) It acts as a central continuous electrical

power distribution unit supplying high-voltage current to localized wireless sensors

**135.** The Digital Personal Data Protection Act, 2023 mandates that a Data Fiduciary can process personal data only if:
(A) The targeted individual's personal identification data is already publicly visible and accessible across commercial social media platforms
(B) The data processing activities are executed strictly utilizing enterprise-grade quantum computing hardware architectures
(C) The commercial company or entity pays a mandatory annual personal data processing taxation tariff to the central government treasury
(D) The Data Principal has given informed consent, or for legitimate uses

**136.** 'RajNET' is an ambitious IT infrastructure project of the Rajasthan government. Its primary goal is to:
(A) Build a unified statewide network connecting Gram Panchayats and municipal bodies
(B) Establish a restricted, encrypted internal social media communication platform accessible exclusively by active state government employees
(C) Deliver free high-definition satellite television receiver equipment and sub-broadcasting access to low-income urban poor households
(D) Systematically survey, measure, and map all subterranean regional groundwater resources across the state using autonomous aerial drones

**137.** Consider the following statements regarding the Information Technology Act, 2000:
I. It gives legal recognition to electronic records and digital signatures.
II. Section 66A of this act, which dealt with offensive online messages, was struck down by the Supreme Court of India in the Shreya Singhal case.
III. The Act strictly prohibits the use of e-commerce in India.
Which of the statements given above are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**138.** Consider the following statements about GIS (Geographic Information System):
I. It integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
II. It is entirely independent of computers and is essentially a paper-based mapping method.
III. GIS applications span urban planning, disaster management, and environmental monitoring.
IV. Raster data in GIS consists of a matrix of cells (or pixels) organized into rows and columns.
Which of the statements given above are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I, II and IV

**139.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Internet of Things (IoT) presents significant privacy concerns for households using smart home devices.
**Reason (R):** Smart home devices continuously collect granular data about user behavior, schedules, and preferences, which can be vulnerable to hacking if not adequately secured.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**140.** In India's data protection regime, what does the term 'Data Fiduciary' correspond to under the European GDPR framework?
(A) Data Subject
(B) Data Processor
(C) Supervisory Authority
(D) Data Controller

www.nodia.in

Downloaded from www.pdf.tube

# ANSWERS

**1.** (A) The use of hardware, software, services, and supporting infrastructure to manage and deliver information
Information Technology encompasses the complete suite of hardware components, software applications, enterprise network services, and foundational operational infrastructure required to capture, process, secure, transmit, and store digital information. In modern organizational environments, this comprehensive technical ecosystem enables seamless communication, drives administrative efficiency, supports data driven strategic planning, and facilitates daily commercial operations across diverse business sectors.

**2.** (A) P-3, Q-1, R-4, S-2
Computer generations are defined by major technical developments in switching hardware components. First generation systems used vacuum tubes for circuitry. Second generation computers introduced solid state transistors, which reduced physical size and heat output. Third generation systems incorporated integrated circuits containing multiple components. Fourth generation computers utilize microprocessors containing thousands of integrated circuits on a single microchip.

**3.** (A) Plotter
Plotters are specialized vector graphics output devices designed to produce high precision hard copies of large scale architectural blueprints, engineering schematics, and complex geographical maps. Unlike conventional raster printers that construct images using microscopic dots, plotters utilize automated mechanical pens or continuous line inkjet mechanisms to draw smooth, continuous lines with precise architectural accuracy across wide paper rolls.

**4.** (A) I and II only
Linux is an open source operating system distributed under general public licenses, allowing users to modify and share its underlying source code freely. Android was created specifically for mobile computing architectures based on a customized Linux kernel foundation. Microsoft Windows is proprietary commercial software rather than open source software, making statement three completely inaccurate in this technological context.

NODIA

**5.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Internet Service Providers serve as the essential commercial link connecting residential end users to global internet infrastructure. They assign unique public internet protocol addresses, perform network routing services, and maintain physical connection backbones. Without an intermediary provider supplying access infrastructure and packet routing mechanisms, personal computing devices cannot establish direct, functional connections with remote web servers across global data networks.

**6.** (C) HTTP (Hypertext Transfer Protocol)
Hypertext Transfer Protocol operates as an application layer standard designed to facilitate data communication across the World Wide Web. It governs how structured messages and hypermedia files, such as text, images, and embedded video, are formatted, requested, and transmitted between web browser clients and central web servers, serving as the foundational architectural protocol for web browsing worldwide.

**7.** (C) III only
Local Area Networks connect computing devices within compact boundaries like single offices or educational buildings. Wide Area Networks span expansive geographical areas across states or countries. Metropolitan Area Networks cover intermediate regions like entire cities, making them larger than Local Area Networks but smaller than Wide Area Networks, rendering the third statement factually incorrect regarding relative coverage sizing.

**8.** (A) Bluetooth (IEEE 802.15.1)
Bluetooth is a wireless communications standard governed by IEEE 802.15.1 designed specifically for low power short range data exchange between personal electronic devices. Operating within the unlicensed 2.4 gigahertz frequency band, it creates localized Personal Area Networks, enabling

seamless wireless interconnectivity between devices like smartphones, laptops, headphones, peripheral keyboards, smartwatches, and local sensors.

**9.** (B) To monitor and control incoming and outgoing network traffic based on security rules
Firewalls act as vital security barriers established between trusted internal private networks and untrusted external public networks like the internet. By analyzing incoming and outgoing data packet headers against predefined security rules and access control policies, firewalls prevent unauthorized external network access attempts, block malicious external intrusions, and enforce comprehensive security compliance across enterprise environments.

**10.** (B) I, II and IV
Launched in 2015, the flagship Digital India initiative focuses on transforming the nation into a digitally empowered society and knowledge economy. Core objectives include delivering robust digital infrastructure as a utility to citizens, expanding electronic governance, and fostering universal digital literacy. The program aims to modernize and digitize public service mechanisms rather than eliminate physical postal network locations entirely.

**11.** (A) UMANG
Unified Mobile Application for New-age Governance serves as a comprehensive single window digital platform developed by the Ministry of Electronics and Information Technology and National e-Governance Division. It provides Indian citizens centralized access to thousands of pan India government services spanning central, state, and local municipal administration levels, including taxation, healthcare, education, utility billing, and social welfare programs.

**12.** (C) Obtaining services, ideas, or content by soliciting contributions from a large group of online users
Crowdsourcing represents a collaborative distributed problem solving model that leverages the collective intelligence, diverse skills, and dispersed effort of large online communities. By issuing open calls across web platforms, organizations and individuals can gather innovative ideas, source localized content, divide complex microtasks, collect distributed public feedback, and fund creative initiatives far more efficiently than using traditional internal organizational methods.

**13.** (D) On-demand scalability of computing resources without major upfront capital expenditure
Cloud computing provides modern commercial enterprises with flexible access to scalable virtual computing resources including processing power, raw storage capacity, databases, and enterprise software applications over the internet. This model eliminates expensive initial capital investments in physical server hardware and data centers, allowing businesses to rapidly scale operational IT capacity up or down depending on real time organizational needs.

**14.** (C) Machine Learning
Machine learning constitutes a prominent branch of artificial intelligence focused on building mathematical algorithms and statistical models that enable computing systems to analyze data, recognize complex patterns, and refine predictions automatically over time. Rather than relying on rigid, pre-programmed procedural rules, machine learning algorithms continuously improve operational performance through experience gained from processing historical and incoming empirical data sets.

**15.** (B) Volume, Velocity, Variety
Big Data analytics is defined by three fundamental dimensions known as the three Vs. Volume represents the massive physical scale and quantity of generated data. Velocity denotes the exceptional speed at which data is continuously produced and processed in real time. Variety refers to the structural diversity of incoming data types, encompassing structured databases, unstructured text, audio, and video formats.

**16.** (D) Utilizing cryptographic hashing and a decentralized, distributed ledger network
Blockchain technology maintains immutability and operational security by recording transaction data across a decentralized network of peer to peer nodes using distributed ledger architecture. Each individual block contains a cryptographic hash of its payload, a timestamp, and the hash of the preceding block. This cryptographic chain structure prevents historical record tampering, ensuring complete transparency and data integrity without centralized authorities.

Click Here to Buy book on Flipkart

**17.** (A) II, I, III, IV
Commercial cellular mobile services launched in India in 1995. The Telecom Regulatory Authority of India was established by statutory legislation in 1997 to oversee sector regulation. Mobile Number Portability was implemented nationwide in 2011 to let users switch operators while retaining numbers. Commercial 5G services were officially launched across major Indian cities in 2022, establishing this precise historical timeline.

**18.** (C) To connect Gram Panchayats across India with high-speed optical fibre broadband
BharatNet is a major flagship telecom project executed by the Government of India to establish a high speed digital network infrastructure across rural territories. By laying state of the art optical fiber network cables, the project aims to connect over two hundred thousand Gram Panchayats, facilitating affordable broadband connectivity, driving rural digital inclusion, and enabling efficient e-governance service delivery nationwide.

**19.** (A) Computer related offences, including hacking and unauthorized access
Section 66 of the Information Technology Act, 2000 establishes statutory legal frameworks and penal provisions covering computer related offences. It penalizes individuals who dishonestly or fraudulently commit actions specified under Section 43, including unauthorized computer access, system hacking, data destruction, network disruption, and electronic resource manipulation, imposing criminal liabilities including imprisonment and financial fines on convicted offenders.

**20.** (B) NEFT → RTGS → IMPS → UPI
National Electronic Funds Transfer was introduced by the Reserve Bank of India in 2005 for batch electronic fund transfers. Real Time Gross Settlement was launched in 2004 for high value continuous settlements. Immediate Payment Service was launched in 2010 for instant mobile banking transfers. Unified Payments Interface was launched in 2016, revolutionizing real time mobile payment ecosystems.

**21.** (B) NASSCOM
The National Association of Software and Service Companies is the non-profit premier trade organization and advocacy body for the technology and software industry in India. NASSCOM plays a crucial role in shaping public policies, promoting international trade, facilitating industry research, encouraging technology innovation, and supporting the strategic global positioning of India's information technology and business process management sectors.

**22.** (C) To promote and facilitate the export of software from India
Software Technology Parks of India was established as an autonomous statutory society under the Ministry of Electronics and Information Technology in 1991. Its primary objective is to encourage, promote, and boost software exports from the country by providing high speed data communications, technical infrastructure, single window regulatory clearances, incubation facilities, and administrative support to registered technology export enterprises.

**23.** (D) iStart Rajasthan
iStart Rajasthan is a flagship initiative launched by the Department of Information Technology and Communication, Government of Rajasthan, to foster entrepreneurship and strengthen the regional startup ecosystem. The platform provides comprehensive support to emerging entrepreneurs through incubation infrastructure, seed funding access, mentorship programs, regulatory simplification, scaling guidance, and direct connections to venture capital networks across the state.

**24.** (A) By enabling online RTI filing and proactive digital data disclosure
Information Technology strengthens the Right to Information framework by facilitating electronic application submission, digital fee payment mechanisms, and real time online status tracking for administrative requests. Furthermore, IT infrastructure enables government departments to maintain proactive public disclosure web portals, making public records, policy decisions, and budgetary allocations easily accessible to citizens, thereby enhancing administrative transparency and public accountability.

**25.** (B) Spatial and geographic data linked to digital maps
Geographic Information System technology is an advanced framework designed to capture, store, manipulate, analyze, manage, and display spatial

Downloaded from www.pdf.tube

and geographic location data. By linking tabular database information to coordinate mapped locations, GIS enables spatial analysis, urban planning, land administration, environmental monitoring, emergency management, and natural resource mapping by projecting complex geographic relationships onto interactive visual digital mapping interfaces.

**26.** (B) It converts electrical input into physical action based on system commands
In an Internet of Things network architecture, an actuator acts as a specialized hardware component responsible for moving or controlling a physical mechanism. Upon receiving controlled electronic signals or processing commands from software systems, actuators convert electrical energy into mechanical movement, heat, light, or fluid flow, executing physical actions like opening valves, adjusting switches, or operating motor components automatically.

**27.** (A) Data Principal
Under the provisions of the Digital Personal Data Protection Act, 2023 of India, the term Data Principal refers specifically to the natural individual person to whom the personal data relates. Where such an individual is a child or a person with a disability, the legal definition extends to include their lawful parents or legally recognized guardians for administrative consent matters.

**28.** (C) I and III only
Information Technology revolutionizes healthcare through electronic health record management systems and remote telemedicine consultations, while empowering education through digital learning platforms and massive open online courses. However, financial technology adoption requires stringent regulatory oversight and risk monitoring rather than eliminating compliance, making statement two false and confirming the factual correctness of statements one and three.

**29.** (B) Second Generation
Second generation computers marked a major technological shift from vacuum tubes to solid state transistors, dramatically enhancing system reliability, speed, and energy efficiency. This generation witnessed the replacement of magnetic drum memory with high speed magnetic core memory units, alongside the development and widespread adoption of early high level assembly and symbolic programming languages including FORTRAN and COBOL.

**30.** (C) Central Processing Unit (CPU)
The Central Processing Unit is the core electronic circuitry component within a computer system that functions as its primary operational brain. It executes program instructions by performing fundamental arithmetic operations, logical decision making, system control signals, and managing input and output data transfers across hardware interfaces, ensuring coordinated task execution across all system hardware components.

NODIA

**31.** (A) P-3, Q-1, R-2, S-4
Operating systems like Linux manage underlying computer hardware and core system resources. Application software like Microsoft Word enables users to perform specific end user productivity tasks. Utility programs like antivirus software maintain system performance, health, and operational security. Web browsers like Google Chrome function as specialized applications designed to navigate, fetch, and display web pages across data networks.

**32.** (D) It translates domain names into IP addresses for data routing
The Domain Name System operates as a fundamental distributed directory database service on the internet. It translates human readable domain names into numerical Internet Protocol addresses required by networking hardware to locate web servers and route data packets. This mechanism enables users to access web resources using memorable text web addresses instead of memorizing complex numeric IP strings.

**33.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The Internet and the World Wide Web represent distinct computer networking concepts. The Internet forms the foundational global physical network infrastructure connecting millions of computing devices worldwide. Conversely, the World Wide Web operates as an information service application running on top of the Internet, utilizing hyperlinked web pages accessed through standard web browser interfaces over network protocols.

**34.** (C) A technology for connecting devices in a wired Local Area Network (LAN)
Ethernet is the dominant physical networking technology standardized under IEEE 802.3 for constructing wired Local Area Networks. It defines physical cabling standards, signal characteristics, and data link layer frame formats used to transmit data packets between interconnected devices like computers, routers, and network switches within physical boundaries like office buildings, schools, and home network environments.

**35.** (B) I, II and IV
Wi-Fi technology relies on IEEE 802.11 physical layer networking standards. Next generation 5G networks offer substantially lower latency and higher bandwidth compared to 4G LTE mobile networks. Bluetooth technology is specifically engineered for short range personal networks spanning meters rather than multiple kilometers, rendering statement three completely incorrect while validating the remaining three factual statements.

**36.** (D) Ransomware
Ransomware is a dangerous form of malicious software engineered to restrict user access to computer systems or local files by encrypting critical data assets using strong cryptographic keys. The malicious actors demand payment, usually in untraceable cryptocurrencies, in exchange for providing decryption keys necessary to restore original file access, posing severe operational threats to digital infrastructure worldwide.

**37.** (B) Mandatory Cryptocurrency Adoption
The Digital India initiative is built upon nine foundational pillars designed to achieve digital transformation across government and society. These core pillars include Broadband Highways, Universal Access to Mobile Connectivity, Public Internet Access Programme, e-Governance, e-Kranti service delivery, Information for All, Electronics Manufacturing, IT for Jobs, and Early Harvest Programmes. Mandatory cryptocurrency adoption is not included among these pillars.

**38.** (A) III, I, II, IV
The National e-Governance Plan was approved by the Indian government in 2006 to establish nationwide digital governance. The Common Service Centres scheme received formal approval under NeGP framework in 2006. The unified UMANG mobile application platform was launched in 2017 to streamline service access. The CoWIN digital vaccination platform was introduced in 2021 during emergency public health management.

**39.** (D) The disparity between groups with access to modern information technology and those without
The Digital Divide describes the socio-economic inequality existing between demographic groups, regions, or communities that have ready access to modern information technology, high speed internet, and digital skills, and those who lack such technological access due to economic, geographical, educational, or infrastructure barriers. Bridging this divide remains a key focus of digital empowerment initiatives globally.

**40.** (A) Software as a Service (SaaS)
Software as a Service is a cloud computing service delivery model where application software is hosted centrally by cloud service vendors and accessed by end users through web browsers over the internet. Customers subscribe to use fully functional applications on a flexible licensing basis without needing to install, host, maintain, or update underlying software code locally.

**41.** (B) Deep Learning
Deep Learning is a advanced subfield of machine learning inspired by the structure and functional mechanics of biological human neural networks. Utilizing deep multi-layered artificial neural network architectures, deep learning algorithms excel at processing, feature extraction, and pattern recognition from massive unstructured datasets, powering breakthroughs in automated speech processing, computer vision, natural language understanding, and image classification.

**42.** (B) Data Mining
Data Mining is the analytical process of extracting meaningful patterns, anomalous trends, dynamic operational insights, and hidden statistical correlations from large, complex datasets stored across enterprise data warehouses. Utilizing sophisticated mathematical models, machine learning algorithms, and statistical techniques, data mining converts raw unstructured data into actionable intelligence for decision making across business and research sectors.

Click Here to Buy book on Amazon

**43.** (A) Through distributed computer nodes using cryptographic proofs on a blockchain
Cryptocurrencies like Bitcoin operate without reliance on central banking institutions or national regulatory intermediaries. Network transactions are verified, validated, and permanently recorded on a public decentralized blockchain ledger through consensus mechanisms executed across independent computer nodes. These cryptographic proofs and decentralized validation processes ensure complete transaction security, public transparency, operational immutability, and protection against unauthorized double spending.

**44.** (C) To design and develop indigenous telecom technology and digital exchanges
The Centre for Development of Telematics was established in 1984 as an autonomous telecommunications research and development institution under the Government of India. Its primary mission is to design, develop, and deploy indigenous telecom technologies, digital telephone switching exchanges, optical communication systems, satellite products, and advanced digital networking solutions tailored to Indian operational environmental requirements.

**45.** (D) National Optical Fibre Network (NOFN)
The BharatNet initiative was originally launched by the Indian government in October 2011 under the official title of National Optical Fibre Network. The project was subsequently renamed BharatNet in 2015 while expanding its operational scope to provide affordable, high speed optical broadband connectivity to all Gram Panchayats across the nation, forming the backbone for digital governance.

**46.** (B) Data Discovery → Data Preparation → Model Building → Model Evaluation
A standard data analytics lifecycle follows a structured sequential framework. The initial phase is Data Discovery, where analytical goals and data sources are identified. This is followed by Data Preparation, involving data cleaning and transformation. Subsequently, statistical or machine learning Model Building takes place, after which rigorous Model Evaluation occurs to validate performance and output accuracy.

**47.** (C) ₹2,00,000
Real Time Gross Settlement is an electronic fund transfer mechanism maintained by the Reserve Bank of India designed specifically for high value monetary transactions. The minimum transaction limit for remitting funds through the RTGS channel is fixed at two lakh rupees, with no upper ceiling on transaction amounts, ensuring continuous real time individual settlement for major financial transfers.

NODIA

**48.** (D) Contracting standard business operations to third-party service providers
Business Process Outsourcing refers to the strategic delegation of non-core operational business functions, administrative processes, or customer support tasks to specialized third-party service vendors. In India, the BPO sector expanded rapidly due to a skilled workforce, cost advantages, and digital infrastructure growth, covering technical support, human resources, financial services, back-office accounting, and customer management operations globally.

**49.** (A) Ministry of Electronics and Information Technology
Software Technology Parks of India functions as an autonomous statutory society established under the administrative oversight and jurisdiction of the Ministry of Electronics and Information Technology, Government of India. The ministry provides executive policy direction, statutory support, and administrative management to STPI to boost software exports, tech entrepreneurship, and software development infrastructure across the nation.

**50.** (C) e-Mitra
Launched as a flagship e-governance initiative by the Government of Rajasthan, e-Mitra serves as a unified service delivery platform offering citizens access to multiple government to citizen and business to consumer services under a single window concept. Operating through online portals and physical kiosks across urban and rural sectors, e-Mitra streamlines utility payments, certificate applications, and official service processing.

**51.** (A) Implementing proactive digital disclosure on public web portals
Section 4 of the Right to Information Act mandates public authorities to proactively publish key administrative information, policy decisions, organizational structures, and operational budgets. Information Technology facilitates this statutory mandate through official public

web portals, enabling seamless public access, reducing the necessity for individual information requests, and fostering transparent, accountable public governance through automated digital transparency measures.

**52.** (D) NavIC
Navigation with Indian Constellation, officially known as NavIC, is an independent regional satellite navigation system designed and constructed by the Indian Space Research Organisation. NavIC provides accurate real time positioning, timing, and navigation services across India and extending up to 1,500 kilometers beyond its national boundaries, supporting critical GIS mapping applications, aviation safety, and commercial location services.

**53.** (B) A smart grid managing electricity distribution from real-time data
Cyber-Physical Systems integrate embedded computational algorithms, network communication channels, and physical processes into cohesive feedback loop architectures. A smart grid managing regional electrical power distribution based on real time data feeds from localized sensors exemplifies a Cyber-Physical System, where dynamic software algorithms monitor computational data streams to directly command physical electrical switching hardware and manage load balances.

**54.** (C) The entity that determines the purpose and means of processing personal data
Under the Indian data protection regulatory framework, a Data Fiduciary is defined as any legal entity, person, company, or public authority that determines the specific purposes and technological means of processing personal data. The Data Fiduciary bears primary statutory responsibility for ensuring lawful data collection, maintaining data security, obtaining consent, and respecting user privacy rights.

**55.** (D) Real-time tracking of goods via GPS and automated inventory management
Information Technology revolutionizes modern supply chain operations and logistics management by introducing real time asset tracking via Global Positioning System modules, radio frequency identification tags, and automated inventory control databases. These technological advancements enhance operational transparency, optimize delivery route planning, lower physical storage costs, mitigate shipment delays, and improve predictive demand forecasting accuracy across global retail distribution networks.

**56.** (A) I and II only
First generation computing systems utilized electronic vacuum tubes, generating substantial thermal heat and requiring expansive physical spaces. Second generation computers replaced fragile vacuum tubes with solid state transistors, dramatically enhancing operational speed, energy efficiency, and physical reliability. Fifth generation computers rely heavily on advanced parallel processing architectures and microprocessors rather than outdated mechanical relays, making statement three false.

**57.** (B) Random Access Memory (RAM)
Random Access Memory functions as the primary volatile storage architecture in computing systems, holding dynamic application code and operating system instructions currently required by the processor. Because RAM requires continuous electrical power to maintain stored binary states, all cached data is immediately lost whenever the computer system suffers power disruption or undergoes a system shut down operation.

**58.** (B) Compiling high-level programming code into machine code
Core functions of an operating system encompass physical memory allocation, processor execution scheduling, file directory management, and input output peripheral hardware control. Compiling high level source code into executable binary machine code is an explicit function performed by programming language compilers and software tools rather than a core functional capability built into operating system software kernels.

**59.** (A) HTTPS
Hypertext Transfer Protocol Secure is the encrypted communication protocol utilized by web browsers to transmit sensitive web data securely across data networks. HTTPS combines standard HTTP with Transport Layer Security encryption protocols, verifying server authenticity and encrypting all data packets sent between client browsers and host web servers, preventing malicious eavesdropping, packet manipulation, and data interception attacks.

Downloaded from www.pdf.tube

**60.** (C) Tim Berners-Lee
English computer scientist Sir Tim Berners-Lee invented the World Wide Web in 1989 while working at CERN. He designed the fundamental technologies powering the modern web ecosystem, including Hypertext Transfer Protocol, Hypertext Markup Language, Uniform Resource Locators, and the first web client browser software, revolutionizing global digital communications and online information sharing forever.

**61.** (A) P-3, Q-4, R-1, S-2
Star topology connects all endpoint network nodes to a single central switching hub. Ring topology arranges devices in a closed circular loop where each device links directly to two adjacent neighbors. Bus topology connects all devices along a single shared main communication cable. Mesh topology features direct point to point connections between every device on the network.

**62.** (B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
Wi-Fi networks operate primarily within the 2.4 gigahertz and 5 gigahertz unlicensed radio frequency bands. The 5 gigahertz frequency band offers higher data transmission speeds with reduced signal interference but covers shorter physical distances, whereas the 2.4 gigahertz band provides superior physical barrier penetration and broader coverage range at relatively lower data throughput speeds.

**63.** (B) Phishing
Phishing represents a widespread form of social engineering cyber attack where attackers deploy deceptive electronic communications, such as fraudulent emails masquerading as reputable organizations, to manipulate recipients into revealing confidential personal data. Victims are coerced into sharing sensitive credentials, banking details, or account passwords, or tricked into downloading malicious file attachments onto their local computing systems.

**64.** (D) National e-Governance Plan (NeGP)
The Digital India programme integrated, expanded, and restructured the earlier National e-Governance Plan initiated in 2006. By consolidating previous digital initiatives under a comprehensive overarching framework, Digital India modernized administrative service delivery, expanded broadband infrastructure nationwide, and transformed fragmented e-governance projects into a unified, citizen-centric national digital empowerment model across urban and rural populations.

**65.** (B) I, II and IV
The UMANG mobile platform stands for Unified Mobile Application for New-age Governance, facilitating access to critical services like EPFO records, DigiLocker, and taxation utilities. The platform supports multiple Indian languages to expand public access. Because UMANG integrates administrative services from both central government agencies and state government departments, statement three is factually incorrect while the remaining statements are valid.

**66.** (C) Mathematical rules used to determine displayed content
In the context of social media platforms, an algorithm refers to a complex set of automated mathematical rules, statistical models, and processing procedures designed to analyze user behavior, engagement metrics, and content parameters. Social media algorithms use these data signals to curate customized user feeds, filter information streams, recommend relevant media, and prioritize specific content delivery in real time.

NODIA

**67.** (A) Private Cloud
A Private Cloud deployment model provides computing infrastructure, server hardware, and software platforms operated exclusively for a single organization. Hosted either on-premises or by third-party data center providers, private clouds deliver enhanced data control, physical security, custom network configurations, and compliance enforcement, making them ideal for enterprises handling highly sensitive data or stringent regulatory mandates.

**68.** (D) Evaluating a machine's ability to exhibit human-like intelligence
The Turing Test, introduced by British mathematician Alan Turing in 1950, is a foundational benchmark proposed to evaluate whether a machine can demonstrate intelligent behavior indistinguishable from a human. In the test, a human evaluator engages in natural language conversations with both a human and a machine without knowing their identities,

assessing artificial intelligence through text conversations.

**69.** (A) I, II, III
Relational Database Management Systems dominated commercial enterprise data processing beginning in the late 1970s. The Apache Hadoop framework emerged in the mid 2000s, introducing MapReduce for batch processing massive distributed datasets across commodity hardware clusters. Subsequently, real time stream processing engines like Apache Spark and Kafka gained widespread adoption during the 2010s to meet low latency data demands.

**70.** (C) To act as a unique digital fingerprint verifying block data integrity
A cryptographic hash in blockchain technology is a fixed length string of alphanumeric characters generated by passing input data through a mathematical hashing algorithm. The hash functions as a unique digital fingerprint for the block payload. Any alteration of the underlying transaction data alters the resulting hash value instantly, enabling nodes to verify data integrity easily across networks.

**71.** (B) 1999
The New Telecom Policy was introduced by the Indian government in 1999, replacing the previous 1994 policy framework. NTP-99 delivered critical structural reforms to the telecom sector by transitioning operators from fixed license fee structures to flexible revenue sharing models, encouraging private sector investments, expanding mobile networks, lowering tariffs, and accelerating telecommunication infrastructure development across India.

**72.** (A) Bharat Broadband Network Limited (BBNL)
Bharat Broadband Network Limited was established as a special purpose vehicle incorporated by the Government of India under the Ministry of Communications to execute the BharatNet project. BBNL oversees the planning, implementation, deployment, management, and operational maintenance of the high speed optical fiber network infrastructure designed to connect Gram Panchayats across the entire nation.

**73.** (D) Section 67
Section 67 of the Information Technology Act, 2000 sets statutory criminal penalties for publishing, transmitting, or causing to be published in electronic form any material that is obscene or appeals to prurient interests. The section specifies terms of imprisonment and substantial financial fines for first and subsequent convictions to maintain legal oversight over digital media contents.

**74.** (B) A unique identifier mapping to a user's bank account for transfers
A Virtual Payment Address functions as a unique digital identifier utilized in the Unified Payments Interface ecosystem to facilitate instant peer to peer and merchant fund transfers. VPAs map directly to underlying bank account details without requiring users to share sensitive financial information like bank account numbers, IFSC codes, or card details during payment transactions.

**75.** (B) IaaS → PaaS → SaaS
Cloud service models vary in consumer administrative control over underlying resources. Infrastructure as a Service grants maximum control, giving users management over operating systems, storage, and networking. Platform as a Service provides medium control, allowing deployment of custom application code on managed runtime environments. Software as a Service offers the least control, providing pre-configured applications fully managed by providers.

**76.** (C) Business Process Management
In the Indian information technology industry framework, BPM stands for Business Process Management. Working in tandem with traditional IT services under the broader IT-BPM export sector, Business Process Management involves optimizing, executing, and managing core business operations, back-office administration, analytics, financial processing, and global client support services through modern digital technologies and structured operational workflows.

**77.** (D) Rajasthan Sampark
Rajasthan Sampark operates as a centralized web portal and helpline established by the Government of Rajasthan to provide citizens with transparent grievance redressal mechanisms. Utilizing information technology infrastructure, the platform allows citizens to register administrative complaints, track grievance status in real time, receive automated

Click Here to Buy book on Flipkart

progress updates, and evaluate departmental response quality across various state government administrative bodies.

**78.** (C) Public Information Officer (PIO)
Under the statutory framework of the Right to Information Act, electronically submitted applications on the RTI portal are automatically routed to the designated Public Information Officer of the concerned public authority. The PIO is legally mandated to process the request, retrieve official departmental records, and furnish requested information to the applicant within statutory timelines established by law.

**79.** (B) Detect naturally available energy, such as reflected sunlight
Passive remote sensors operate by detecting and measuring naturally available electromagnetic radiation emitted or reflected from physical targets on the Earth's surface. Unlike active sensors that generate their own illumination beams, passive sensors rely primarily on natural solar radiation during daylight hours or thermal infrared energy naturally radiated by ground objects to capture observational spatial data.

**80.** (D) IPv6
Internet Protocol version 6 is the network layer protocol developed to succeed IPv4, providing a massive 128-bit address space capable of supporting $3.4 \times 10^{38}$ unique IP addresses. This exponential address expansion is vital for the Internet of Things ecosystem, allowing billions of smart devices, sensors, and appliances to obtain unique public IP addresses for seamless connectivity.

**81.** (A) An entity processing personal data on behalf of a Data Fiduciary
Within the Indian legal framework for digital personal data protection, a Data Processor is defined as any person, entity, or service provider that processes personal data on behalf of a Data Fiduciary. The Data Processor operates strictly under contractual instructions from the Data Fiduciary, providing technical storage, data management, computation, or analytical processing capabilities.

**82.** (C) $C_2C$ (Consumer-to-Consumer)
Consumer-to-Consumer e-commerce defines a digital business model where individual consumers conduct trade transactions directly with other consumers using online marketplace platforms. Platforms like OLX and eBay facilitate these transactions by providing user account systems, classified search tools, and payment mechanisms, enabling individuals to buy, sell, or exchange second hand goods directly without commercial intermediaries.

**83.** (A) First Generation
ENIAC and UNIVAC are iconic historical examples of First Generation computing systems built during the 1940s and 1950s. These early computers relied on thousands of vacuum tubes for electronic circuitry, consumed immense amounts of electrical power, generated substantial heat, required entire rooms for physical housing, and utilized machine language for executing basic computational procedures.

**84.** (A) I and II only
Scanners operate as input devices by digitizing physical printed documents into electronic image formats. The motherboard acts as the main system printed circuit board connecting processing chips, RAM modules, and expansion peripherals. Display monitors are output devices designed to display visual data rather than input devices, rendering statement three incorrect while validating statements one and two.

**85.** (B) It allows a user to execute more than one program simultaneously.
Multitasking in modern operating systems refers to the system capability of executing multiple independent software applications or computational processes concurrently. The operating system manages CPU time slices, memory allocation, and task switching schedules, allowing users to run background tasks while actively interacting with foreground applications seamlessly on a single computing system without manual interrupters.

**86.** (C) A software application used to retrieve and display Web content
A web browser is an essential client software application designed to retrieve, render, and display web content formatted in Hypertext Markup Language across data networks. Browsers convert HTML documents, CSS styling, and JavaScript code fetched from remote web servers into interactive visual web pages, enabling end users to navigate websites, click hyperlinks, and interact with web applications online.

NODIA

**87.** (D) The Top-Level Domain indicating an Indian government website
In the provided Uniform Resource Locator structure, "gov.in" represents the Top-Level Domain and country code structure. The ".gov" segment designates a verified government entity, while the ".in" portion designates the country code top level domain for India. Together, they confirm that the website belongs specifically to an official Indian government authority on the web.

**88.** (A) Router
A router is an essential layer three networking device that connects multiple distinct local networks together and manages data routing across them. By analyzing destination IP address headers on incoming data packets and referencing internal routing tables, routers determine the optimal path for forwarding data packets across interconnected networks to reach their destination host computers efficiently.

**89.** (C) 3G
Third Generation mobile telecommunication technology marked a major milestone by shifting cellular networks toward mobile broadband connectivity using standards like HSPA and UMTS. 3G enabled high speed packet switched data transfer alongside digital voice calls, supporting web browsing, video calling, mobile email, and early mobile app ecosystems that paved the way for modern smartphone adoption worldwide.

**90.** (A) P-3, Q-4, R-1, S-2
Trojan Horses represent deceptive malware disguised as legitimate application software. Worms are self-replicating malicious programs that automatically propagate across network infrastructures without human intervention. Keyloggers are surveillance software tools designed to record physical user keystrokes to steal confidential passwords. Distributed Denial of Service attacks flood targets with automated traffic to overwhelm server capacity completely.

**91.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Digital signature certificates are heavily promoted across e-governance platforms because they offer statutory legal validity for electronic documentation. Utilizing public key cryptography, digital signatures verify the sender's identity, detect unauthorized message alterations, and ensure data integrity, providing legally recognized non-repudiation that prevents signers from denying their electronic signatures in formal legal proceedings.

**92.** (C) Common Service Centres (CSC)
The Common Service Centres initiative is a key pillar of the Digital India programme designed to deliver government services to rural populations. Managed by local Village Level Entrepreneurs, CSCs function as digital access points offering essential services including utility bill payments, digital document procurement, banking services, passport applications, healthcare registration, and agricultural information across rural areas.

NODIA

**93.** (D) An environment reinforcing existing user opinions without opposing views
On social media networks, an Echo Chamber refers to a digital environment where user engagement algorithms continuously present news, ideas, and opinions matching the user's existing personal beliefs. This dynamic insulates individuals from opposing perspectives, reinforces confirmation bias, amplifies ideological polarizations, and restricts exposure to balanced alternative viewpoints across online social communities.

**94.** (C) Automated provisioning and de-provisioning of cloud resources based on demand
Elasticity in cloud computing describes the system's dynamic capacity to automatically provision, scale up, scale down, or de-provision computing resources such as processing power, storage, and memory in response to real-time workload fluctuations. This operational agility ensures optimized performance during peak traffic demands while minimizing operational expenditure during periods of lower resource utilization.

**95.** (B) I, II and III
Supervised machine learning uses labeled training datasets to train algorithms. Unsupervised learning analyzes unlabeled datasets to discover underlying structural patterns. Natural Language Processing enables software to interpret human speech and text. Because machine learning relies fundamentally on complex mathematical optimization algorithms, statement four is completely false while the first three statements remain true.

**96.** (D) HDFS (Hadoop Distributed File System)
Hadoop Distributed File System is the core storage component of the Apache Hadoop open-source framework designed specifically for storing massive datasets across distributed commodity server clusters. HDFS splits incoming files into large data blocks, distributing them redundantly across multiple storage nodes to achieve fault tolerance, high data throughput, and reliable storage management for big data applications.

**97.** (A) Mining
Mining is the computational process used in proof of work blockchain networks like Bitcoin to validate transaction records and append new blocks to the distributed ledger. Specialized computer nodes solve complex mathematical cryptographic puzzles, requiring massive computational work, to maintain consensus, protect the network against double spending, and mint new cryptocurrency tokens as algorithmic rewards.

**98.** (C) TRAI (Telecom Regulatory Authority of India)
The Telecom Regulatory Authority of India was established by an Act of Parliament in 1997 to regulate telecommunication services across the nation. TRAI sets technical standards, regulates tariffs, ensures fair market competition among operators, protects consumer interests, and provides independent advisory recommendations to the central government regarding telecom policies and spectrum allocations.

**99.** (A) Total internal reflection
Optical fibre cables utilized in the BharatNet broadband infrastructure transmit digital data as light pulses using the physical principle of total internal reflection. When light travels through the inner optical glass core at an angle exceeding the critical angle, it reflects completely off the cladding boundary without escaping, enabling high-speed, long-distance data transmission with minimal signal attenuation.

**100.** (B) 2000
The Information Technology Act was officially enacted by the Parliament of India in June 2000 and came into force in October 2000. It established the primary statutory framework in India for recognizing electronic commerce, legalizing digital signatures, preventing computer crimes, regulating certifying authorities, and protecting electronic records across government and private business operations.

**101.** (B) In half-hourly batches throughout the day
National Electronic Funds Transfer is an electronic payment system maintained by the Reserve Bank of India that processes transactions differently from continuous Real Time Gross Settlement. NEFT processes and settles customer fund transfer requests in half-hourly batches continuously throughout twenty-four hours a day, operating round the clock every day of the year nationwide.

**102.** (C) Technology-driven operational services such as BPOs and call centers
Information Technology Enabled Services encompass business operations and administrative processes that leverage information technology to enhance organizational efficiency. ITES covers back-office operations, medical transcription, legal process outsourcing, global call centers, supply chain analytics, customer support services, and transaction management, forming a highly significant segment of India's global technology exports and service sector employment.

**103.** (D) Duty-free hardware imports and export tax incentives
Units registered under the Software Technology Parks of India scheme enjoy key statutory benefits designed to boost software exports. These incentives include complete duty-free import of capital goods and technical equipment, duty-free domestic procurement, single window export clearances, tax benefits, high speed data communication links, and access to specialized technical infrastructure within software parks nationwide.

**104.** (A) Direct Benefit Transfer (DBT) and financial inclusion
The Bhamashah Yojana was launched by the Government of Rajasthan to establish financial inclusion and direct benefit transfer mechanisms, placing financial decision making authority with female heads of households. Evolving into the Jan Aadhaar platform, it serves as a unified socio-economic database enabling direct delivery of government subsidies, cash benefits, and social welfare support to citizens.

Downloaded from www.pdf.tube

**105.** (B) Organizational structure details and officer duties
Proactive disclosure under Section 4 of the Right to Information Act requires public authorities to routinely publish public administrative details on official web portals. This includes organizational structures, public officer duties, decision making procedures, operational budgets, rules, and contact information, ensuring transparent public access while excluding protected national security data and private personal records.

**106.** (B) Vector and Raster
In Geographic Information Systems, spatial data is represented using vector and raster data models. Vector data uses discrete geometric primitives, such as points, lines, and polygons, to represent physical features like roads or boundaries. Raster data represents continuous spatial phenomena using a regular grid matrix of square cells or pixels carrying specific attribute values.

**107.** (A) Weak default passwords and lack of security updates on many IoT devices
A major cybersecurity vulnerability in Internet of Things ecosystems stems from the prevalence of weak default factory passwords, inadequate hardware encryption capabilities, and infrequent vendor security updates across low power consumer smart devices. These vulnerabilities expose IoT networks to unauthorized access, remote hijacking, and inclusion in malicious botnets deployed to execute distributed denial of service attacks.

**108.** (C) Collecting only personal data strictly necessary for a specified purpose
Data Minimization is a core data privacy principle requiring organizations to collect, process, and retain only personal data that is strictly necessary, adequate, and relevant for achieving specific, explicitly stated operational purposes. This principle limits unnecessary personal data accumulation, reduces the impact of data security breaches, and protects individual privacy rights across digital platforms.

**109.** (D) Cloud collaboration tools and high-speed internet
The widespread shift toward remote work and distributed organizational environments has been enabled by cloud collaboration platforms, video conferencing tools, shared digital workspaces, and pervasive high speed internet connectivity. These digital technologies allow geographically dispersed employees to communicate seamlessly, access corporate databases securely, collaborate on projects in real time, and maintain operational efficiency remotely.

**110.** (C) Third Generation
Third Generation computing systems introduced integrated circuits containing multiple electronic components on silicon chips. This technological era witnessed major software advances, including the development of time sharing operating systems that allowed multiple users to share processing resources simultaneously. Additionally, human computer interaction was transformed during this period through the introduction of the computer mouse and keyboard.

**111.** (B) Disk Defragmenter
Disk Defragmenter is a system utility software designed to optimize magnetic hard disk drive performance. It reorganizes physically fragmented data files stored in non-contiguous disk sectors, consolidating scattered file segments into contiguous storage sectors. This structural reorganization reduces mechanical drive head movement, thereby accelerating file read and write speeds and improving overall operating system efficiency.

NODIA

**112.** (D) Computer hardware and end-user application software
An operating system acts as an indispensable intermediary software layer bridging physical computer hardware and user application software. It translates application commands into low level hardware operations, manages hardware components like processors, memory modules, and storage devices, and provides a standardized user interface and runtime environment for executing end-user applications efficiently across diverse computing hardware systems.

**113.** (A) I and II only
Web browsers are client software applications used to retrieve, format, and display web content on user devices. Search engines are specialized web applications that index online web pages and retrieve relevant search results based on user queries. Because browsers and search engines perform distinct operational functions, statement three is incorrect while statements one and two are factually true.

**114.** (C) Secure
The letter 's' in the HTTPS acronym stands specifically for Secure. Hypertext Transfer Protocol Secure indicates that standard HTTP communications across the web are encrypted using Transport Layer Security protocols. This encryption layer protects sensitive user data, authentication credentials, and financial transactions from unauthorized packet interception, tampering, and eavesdropping during internet transmissions.

**115.** (A) Wide Area Network (WAN)
A Wide Area Network is a telecommunications network extending across large geographical distances, connecting disparate local networks across cities, regions, or countries. Organizations operating multiple branch offices utilize WAN infrastructure, such as dedicated leased telecommunication lines or virtual private networks over the internet, to enable seamless remote data exchange, central database access, and inter-office communications.

**116.** (C) 5G NR
Fifth Generation New Radio mobile network technology utilizes advanced physical layer innovations, including Massive MIMO antenna arrays, beamforming, and millimeter wave spectrum allocations. These technical enhancements allow 5G networks to deliver multi-gigabit peak data transmission speeds, ultralow latency communications, higher network capacity, and massive device connectivity compared to previous cellular generations.

**117.** (B) A software flaw unknown to the vendor and actively exploited by attackers
A Zero-Day vulnerability refers to a security flaw in software that is unknown to the vendor or developers, leaving zero days to deploy a patch before potential exploitation. Because no security patch exists, attackers can exploit these vulnerabilities through zero-day attacks, posing major risks to corporate networks, operating systems, and critical software infrastructure.

**118.** (C) e-Governance: Reforming Government through Technology
The e-Governance pillar of Digital India focuses on leveraging information technology to transform government procedures and public service delivery. Key objectives include simplifying complex administrative application forms, integrating diverse departmental services onto single digital portals, automating workflow processing, and eliminating redundant manual documentation to establish efficient, transparent, and accessible public administration across India.

**119.** (A) P-2, Q-1, R-4, S-3
DigiLocker provides citizens with cloud storage for issuing and storing official digital documents. e-Hospital streamlines administrative processes like online registration and doctor appointments in government hospitals. e-NAM functions as a pan-India electronic trading portal connecting agricultural commodity markets. SWAYAM operates as a national education portal hosting massive open online courses for students nationwide.

**120.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Microblogging platforms like X enforce strict character limits on public posts. This structural constraint forces users to communicate concisely, making information consumption faster for audiences. Consequently, character limits encourage real time news reporting, rapid trend dissemination, and concise updates, shaping microblogging into an efficient ecosystem for real time global communication.

**121.** (B) It lets multiple virtual servers run on one physical server to maximize usage
Server Virtualization is a foundational cloud technology that uses specialized software called a hypervisor to abstract physical server hardware. Hypervisors partition a single physical server into multiple isolated virtual machines, each running its own operating system and applications. This approach maximizes hardware utilization, lowers data center energy costs, and simplifies server provisioning and management.

**122.** (B) Natural Language Processing (NLP)
Chatbots deployed on websites rely heavily on Natural Language Processing, a key domain of artificial intelligence. NLP algorithms enable software to parse, interpret, and process human text or voice inputs by analyzing linguistic syntax, contextual meaning, and user intent, allowing automated systems to formulate coherent, contextually accurate responses to customer queries in real time.

Click Here to Buy book on Amazon

**123.** (A) The speed of data generation, processing, and real-time analysis
The Velocity dimension in Big Data analytics denotes the extraordinary speed at which digital data is generated, collected, transmitted, and analyzed. Fueled by real time data streams from internet sensors, social media interactions, online transactions, and connected IoT devices, velocity demands specialized real time processing engines capable of handling continuous data streams instantaneously.

**124.** (C) A self-executing contract encoded directly onto a blockchain
A Smart Contract is a self-executing digital program encoded directly onto a blockchain ledger. Containing predefined terms and conditional logical rules, smart contracts automatically execute transactions, enforce compliance, or transfer assets when specified conditions are verified by network consensus, eliminating the need for central legal intermediaries and reducing counterparty risks in automated transactions.

**125.** (D) Retain their mobile number when switching telecom operators
Mobile Number Portability is a regulatory mechanism implemented in the Indian telecom sector allowing mobile phone subscribers to switch their cellular service provider while retaining their existing mobile telephone number. MNP promotes market competition among telecom operators, improves service quality, protects consumer convenience, and eliminates the burden of changing phone numbers when switching networks.

**126.** (A) I, II and IV
BharatNet is funded by the Universal Service Obligation Fund and aims to deliver at least 100 Mbps broadband connectivity to all Gram Panchayats. State governments and private operators can utilize this open infrastructure. Because BharatNet incorporates satellite and wireless radio links for difficult terrains alongside optical fiber, statement three is incorrect while statement four is valid.

**127.** (A) Section 43
Section 43 of the Information Technology Act, 2000 addresses civil liability and compensation for unauthorized access to computer systems. It penalizes individuals who download, copy, extract, or tamper with data from any computer, system, or network without permission from the owner, rendering offenders liable to pay damages by way of compensation to affected parties.

**128.** (D) Reserve Bank of India (RBI) and Indian Banks' Association (IBA)
The National Payments Corporation of India was established as an umbrella organization for operating retail payment and settlement systems across India. Founded in 2008 as a joint initiative of the Reserve Bank of India and the Indian Banks' Association, NPCI drives digital payment innovations including UPI, IMPS, RuPay, and Aadhaar Enabled Payment Systems.

NODIA

**129.** (A) Income tax holidays and statutory indirect tax exemptions
Special Economic Zones offer fiscal incentives to attract investments and promote technology export services. IT companies operating within SEZs enjoy major tax benefits, including income tax exemptions under tax holiday provisions, duty-free import of capital goods, and exemptions from indirect taxes like Goods and Services Tax, drastically reducing operational costs for export businesses.

**130.** (C) India was undergoing economic liberalization to boost foreign exchange through exports
The Software Technology Parks of India scheme was initiated in 1991 during structural economic liberalization in India. Seeking to resolve balance of payments challenges and build foreign exchange reserves, the government established STPI to support technology exports, provide single window regulatory clearances, build satellite communication links, and foster a globally competitive Indian software engineering industry.

**131.** (A) A Special Economic Zone (SEZ) housing major IT/ITES companies
Mahindra World City in Jaipur is a major multi-product Special Economic Zone and modern industrial hub in Rajasthan. It houses a dedicated IT/ITES SEZ zone that hosts prominent domestic and multinational software development, business process outsourcing, and technology service companies, driving technology investments, export revenue, and high-skilled employment creation in the state.

**132.** (D) Digitizing records to prevent tampering and enable rapid retrieval
e-Governance directly strengthens the Right to Information framework by digitizing government records, automating file tracking, and establishing public online access portals. Converting physical files into structured electronic databases prevents record tampering, ensures secure document preservation, accelerates data retrieval for administrative queries, and enables seamless public access to official information, enhancing democratic administrative transparency.

**133.** (B) United States of America
The Global Positioning System is a space-based satellite navigation system designed, owned, and operated by the United States government, specifically maintained by the United States Space Force. Comprising a constellation of operational satellites, GPS provides accurate positioning, navigation, and timing services to civilian, commercial, and military users worldwide free of direct usage charges.

**134.** (C) It connects IoT devices to the cloud, providing local processing and security
An IoT Gateway acts as a critical link bridging localized Internet of Things edge devices, smart sensors, and remote cloud infrastructure. Gateways translate communication protocols across heterogeneous device networks, perform localized data aggregation and filtering, enforce security protocols, and manage data transmissions between local sensor networks and central cloud processing applications.

**135.** (D) The Data Principal has given informed consent, or for legitimate uses
The Digital Personal Data Protection Act, 2023 mandates that a Data Fiduciary may process personal data only after obtaining free, informed, specific, and unambiguous consent from the Data Principal. The law allows data processing without consent only under specified statutory exemptions defined as legitimate uses, such as medical emergencies, law enforcement actions, or public health responses.

**136.** (A) Build a unified statewide network connecting Gram Panchayats and municipal bodies
RajNET is an ambitious integrated network infrastructure project implemented by the Government of Rajasthan. Its primary objective is to establish a secure, multi-mode statewide network connecting government offices from the state capital down to Gram Panchayats and municipal bodies, utilizing optical fiber, wireless links, and satellite terminals to power reliable e-governance service delivery.

**137.** (A) I and II only
The Information Technology Act, 2000 grants formal legal recognition to electronic records and digital signatures. Section 66A of the act was struck down as unconstitutional by the Supreme Court of India in the landmark Shreya Singhal case. Because the act actively facilitates and legally recognizes e-commerce transactions, statement three is false while statements one and two are correct.

**138.** (B) I, III and IV
Geographic Information System integrates technology for processing spatial data, supporting applications across urban planning, disaster response, and environmental management. Raster data consists of cell matrices or pixels. Because GIS is fundamentally computer-dependent rather than a paper-based mapping method, statement two is false, making option B containing statements one, three, and four the correct selection.

**139.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Internet of Things smart home devices introduce privacy concerns because they continuously track user behaviors, daily schedules, and personal preferences. When smart home devices lack strong encryption protocols or regular software updates, they become vulnerable to malicious cyber intrusions, creating risks of unauthorized data collection, surveillance, and personal privacy breaches in residential environments.

**140.** (D) Data Controller
In India's data protection framework established by the Digital Personal Data Protection Act, 2023, the term Data Fiduciary corresponds directly to the concept of a Data Controller under Europe's General Data Protection Regulation. Both terms define legal entities that determine the operational purposes and technical means for collecting, storing, and processing personal data.



Downloaded from www.pdf.tube

# CHAPTER 02
# Defense Technology

NODIA

**1.** Which of the following best describes the concept of "dual-use technology" in the context of national security?
(A) Technology that can be used simultaneously by the Army and the Navy
(B) Technology that has both civilian commercial applications and military applications
(C) Technology developed by foreign nations but manufactured in India
(D) Technology exclusively designed for offensive and defensive cyber warfare

**2.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Achieving self-reliance in defence manufacturing is considered vital for India's strategic autonomy.
**Reason (R):** High dependence on imported military hardware can severely restrict independent diplomatic and strategic decisions during conflicts.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**3.** The acronym C4ISR is widely used in modern defense strategy and technology. What does the "I" stand for in this acronym?
(A) Intelligence
(B) Interoperability
(C) Information
(D) Integration

**4.** Which of the following is a direct consequence of a nation possessing strong indigenous defense technology capabilities?
(A) Complete elimination of asymmetric warfare threats
(B) Reduced defense budget allocation for research and development
(C) Enhanced deterrent capability and reduction of foreign supply chain vulnerabilities
(D) Automatic inclusion into the United Nations Security Council

**5.** In defense economics, an "offset clause" is often included in major foreign procurement contracts. What is its primary objective?
(A) To require foreign suppliers to reinvest a set percentage into domestic industry
(B) To extend the military equipment payment schedule over a fixed ten-year period
(C) To grant the buyer rights to cancel the contract if domestic alternatives emerge
(D) To compensate for environmental damage caused by large-scale military exercises

**6.** The Defence Research and Development Organisation (DRDO) was established in which year by amalgamating existing defence science organizations?
(A) 1947
(B) 1958
(C) 1969
(D) 1971

**7.** Consider the following statements regarding the formation of DRDO:
I. It was formed by amalgamating the Defence Science Organisation (DSO).
II. It incorporated the Directorate of Technical Development & Production (DTDP).
III. It was initially established under the Ministry of Home Affairs before moving to the Ministry of Defence.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**8.** What is the official motto of the Defence Research and Development Organisation (DRDO)?
(A) Nabhah Sparsham Deeptam
(B) Vande Mataram
(C) Balasya Mulam Vigyanam
(D) Shano Varuna

**9.** DRDO operates under the administrative control of which specific department within the Ministry of Defence?
(A) Department of Defence Production
(B) Department of Ex-Servicemen Welfare
(C) Department of Military Affairs
(D) Department of Defence Research and Development

**10.** How does the core mandate of DRDO differ from that of Defence Public Sector Undertakings (DPSUs) like HAL and BEL?
(A) DRDO develops technology, while DPSUs manufacture and integrate systems
(B) DRDO handles large-scale manufacturing, while DPSUs conduct basic research
(C) DRDO imports advanced foreign technology, while DPSUs export indigenous systems
(D) DRDO caters exclusively to the Army, while DPSUs serve only the Air Force

**11.** Match the DRDO Laboratories in List I with their respective locations in List II:
**List I: DRDO Laboratory**
P. Defence Laboratory (DLJ)
Q. Defence Electronics Application Laboratory (DEAL)
R. High Energy Materials Research Laboratory (HEMRL)
S. Aeronautical Development Establishment (ADE)
**List II: Location**
1. Dehradun
2. Pune
3. Jodhpur
4. Bengaluru
(A) P-3, Q-1, R-2, S-4
(B) P-1, Q-3, R-4, S-2
(C) P-3, Q-2, R-1, S-4
(D) P-2, Q-1, R-3, S-4

**12.** The Defence Laboratory Jodhpur (DLJ) is a crucial DRDO lab located in Rajasthan. Which of the following areas is its primary field of research?
(A) Submarine acoustic stealth technology and underwater sonar systems
(B) Camouflage, desert warfare technologies, and materials science
(C) Hypersonic cruise missile propulsion and ramjet engine design
(D) Deep-space satellite communication and orbital tracking networks

**13.** Which of the following DRDO laboratories is primarily responsible for the development of electronic warfare systems like the "Samyukta" and "Divya Drishti"?
(A) Defence Electronics Research Laboratory (DLRL)
(B) Defence Metallurgical Research Laboratory (DMRL)
(C) Vehicle Research and Development Establishment (VRDE)
(D) Snow and Avalanche Study Establishment (SASE)

**14.** Consider the following statements regarding major DRDO achievements:
I. Advanced Towed Artillery Gun System (ATAGS) is a 155mm/52 calibre gun developed by DRDO.
II. Rustom-II (Tapas BH-201) is a Medium Altitude Long Endurance (MALE) unmanned aerial vehicle.
III. Netra is an indigenous Airborne Early Warning and Control (AEW&C) system.
IV. INS Arihant's nuclear reactor was entirely imported from Russia without DRDO involvement.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) III only
(C) IV only
(D) II and IV only

**15.** Identify the incorrect pair regarding DRDO laboratories and their primary domain:
(A) DMRL - Advanced metallic materials and alloys
(B) INMAS - Nuclear medicine and allied sciences
(C) CAIR - Artificial intelligence and robotics
(D) CVRDE - Naval submarine propulsion systems

**16.** What is the fundamental difference in the flight path between a ballistic missile and a cruise missile?
(A) A ballistic missile remains within the lower atmosphere, whereas a cruise missile primarily travels in deep outer space.
(B) A ballistic missile flies parallel to the ground surface, whereas a cruise missile drops vertically on its target location.
(C) A ballistic missile follows an unpowered parabolic arc, while a cruise missile is continuously powered and guided.

Click Here to Buy book on Flipkart

(D) A ballistic missile can only be launched from submarines, whereas a cruise missile is launched exclusively from land.

**17.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Cruise missiles are generally harder to detect by traditional early-warning radar systems than long-range ballistic missiles.
**Reason (R):** Cruise missiles fly at very low altitudes, often hugging the terrain, which hides them below the radar horizon.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**18.** Why do ballistic missiles generally use rockets that carry both fuel and oxidizer, unlike most cruise missiles?
(A) Ballistic missiles travel at much slower speeds than cruise missiles during flight
(B) Ballistic missiles need to hover over target areas for long extended periods
(C) Ballistic missiles have significantly shorter operational ranges than cruise missiles
(D) Ballistic missiles exit the atmosphere where no ambient oxygen exists

**19.** Match the missile classifications in List I with their typical speed regimes in List II:
**List I: Missile Classification**
P. Subsonic cruise missile
Q. Supersonic cruise missile
R. Hypersonic cruise missile
S. ICBM reentry speed
**List II: Speed Regime**
1. Between Mach 1 and Mach 3
2. Greater than Mach 5
3. Significantly greater than Mach 15
4. Less than Mach 1
(A) P-4, Q-1, R-2, S-3
(B) P-1, Q-4, R-3, S-2
(C) P-4, Q-2, R-1, S-3
(D) P-3, Q-1, R-2, S-4

**20.** Which propulsion technology uses the forward motion of the vehicle to compress incoming air for combustion and operates optimally only at supersonic speeds, commonly utilized in advanced cruise missiles?
(A) Turbofan engine
(B) Solid-propellant rocket motor
(C) Ramjet engine
(D) Liquid-propellant rocket motor

**21.** Regarding the staging of ballistic missiles, identify the correct statement:
(A) Multi-stage missiles shed their empty booster stages to reduce weight and increase overall range.
(B) Single-stage missiles are generally used for intercontinental distances due to their high fuel efficiency.
(C) All stages of modern solid-fuel ballistic missiles can be easily turned off and restarted multiple times.
(D) The reentry vehicle is always heavily shielded with lead to prevent radiation leaks during launch.

**22.** The BrahMos missile is a joint venture between India's DRDO and NPOM of which country?
(A) France
(B) Israel
(C) United States
(D) Russia

**23.** The Agni-V missile is classified as an Intercontinental Ballistic Missile (ICBM). What is its approximate operational range?
(A) 1,500 to 2,000 km
(B) 3,000 to 4,000 km
(C) 5,000 to 5,500 km or more
(D) 10,000 to 15,000 km

**24.** Which of the following best describes the Akash missile system developed by India?
(A) Anti-tank precision guided missile system
(B) Submarine-launched strategic ballistic missile
(C) Medium-range surface-to-air missile
(D) Air-to-air beyond-visual-range missile

**25.** Consider the following statements regarding the Prithvi missile:
I. It is a short-range surface-to-surface ballistic missile.
II. Prithvi-I was originally designed with a liquid propellant engine.
III. It cannot carry nuclear warheads under any circumstances.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only

Downloaded from www.pdf.tube

(C) I and III only
(D) I, II and III

**26.** Consider the following statements regarding the BrahMos missile:
I. It operates on a "fire and forget" principle.
II. It flies at a top speed of Mach 2.8 to Mach 3.0.
III. It can be launched from land, ships, submarines, and aircraft.
IV. It was initially developed exclusively as an air-to-air missile.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II and IV only
(D) I, II, III and IV

**27.** Arrange the following Agni missiles in increasing order of their operational ranges:
I. Agni-II
II. Agni-V
III. Agni-I
IV. Agni-IV
(A) III, I, IV, II
(B) I, III, IV, II
(C) III, IV, I, II
(D) I, II, III, IV

**28.** Which of the following missiles is NOT a surface-to-surface missile?
(A) Prithvi
(B) Astra
(C) Agni
(D) Shaurya

**29.** The Integrated Guided Missile Development Programme (IGMDP) was conceived and heavily driven by which eminent Indian scientist?
(A) Dr. A.P.J. Abdul Kalam
(B) Dr. Homi J. Bhabha
(C) Dr. Vikram Sarabhai
(D) Dr. K. Radhakrishnan

**30.** In which year was the Integrated Guided Missile Development Programme (IGMDP) formally announced as successfully completed by the Ministry of Defence?
(A) 1998
(B) 2003
(C) 2008
(D) 2014

**31.** Which of the following sequences represents the correct set of five core missile systems developed under the original IGMDP?
(A) Prithvi, Agni, BrahMos, Nirbhay, Nag
(B) Agni, Akash, Astra, Shaurya, Sagarika
(C) Trishul, Akash, Nag, Prahaar, Pralay
(D) Prithvi, Agni, Trishul, Akash, Nag

**32.** Which short-range surface-to-air missile project under the IGMDP was eventually de-linked and utilized as a technology demonstrator due to developmental delays?
(A) Akash
(B) Nag
(C) Trishul
(D) Barak

NODIA

**33.** The Nag missile system, developed under the IGMDP, is specifically designed for which operational role?
(A) Destroying low-flying enemy aircraft
(B) Anti-tank operations
(C) Hitting deep command bunkers over 1000 km away
(D) Intercepting incoming ballistic missiles

**34.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The IGMDP was initiated in the early 1980s to achieve self-reliance in missile technology.
**Reason (R):** International technology control regimes like the MTCR restricted India's access to critical missile technologies from foreign countries.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**35.** INS Visakhapatnam, INS Mormugao, INS Imphal, and INS Surat belong to which class of indigenous warships built for the Indian Navy?
(A) Project 15B stealth destroyers
(B) Project 15A Kolkata-class guided destroyers
(C) Project 17A Nilgiri-class stealth frigates
(D) Project 75 Kalvari-class diesel submarines

**36.** Match the Indian Navy Projects in List I with their respective vessel types/classes in List II:
**List I: Project**

P. Project 17A
Q. Project 28
R. Project 75
S. Project 15A

**List II: Vessel Type/Class**

1. Scorpene-class submarines
2. Kamorta-class anti-submarine corvettes
3. Nilgiri-class stealth frigates
4. Kolkata-class destroyers

(A) P-3, Q-2, R-1, S-4
(B) P-4, Q-1, R-2, S-3
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-3, R-4, S-1

**37.** Consider the following statements regarding INS Vikrant:
I. It is the first aircraft carrier designed and built indigenously in India.
II. It was constructed by the Cochin Shipyard Limited (CSL).
III. It operates exclusively with vertical take-off aircraft and lacks a ski-jump.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**38.** Which was the first indigenous stealth frigate class built in India under Project 17, incorporating advanced signature-reduction technologies?
(A) Talwar class
(B) Brahmaputra class
(C) Godavari class
(D) Shivalik class

**39.** The Kalvari, Khanderi, and Karanj are vessels belonging to which category of the Indian Navy's fleet?
(A) Landing Ship Tanks
(B) Diesel-electric attack submarines
(C) Nuclear-powered ballistic missile submarines
(D) Mine countermeasures vessels

**40.** Garden Reach Shipbuilders & Engineers (GRSE), a premier warship building company in India, is headquartered in which city?
(A) Mumbai
(B) Visakhapatnam
(C) Kolkata
(D) Kochi

**41.** The HAL Tejas is classified as which generation of fighter aircraft?
(A) 3rd generation
(B) 4th / 4.5 generation
(C) 5th generation
(D) 6th generation

**42.** While Hindustan Aeronautics Limited (HAL) is the principal manufacturer of the Tejas LCA, which nodal agency under DRDO is primarily responsible for its design and development?
(A) Aeronautical Development Agency (ADA)
(B) National Aerospace Laboratories (NAL)
(C) Gas Turbine Research Establishment (GTRE)
(D) Defence Avionics Research Establishment (DARE)

**43.** Consider the following statements regarding India's AMCA project:
I. AMCA stands for Advanced Medium Combat Aircraft.
II. It is designed to be India's first 5th-generation stealth fighter.
III. It features internal weapons bays to reduce radar cross-section.
IV. The project has already seen its full induction into the Indian Air Force as of 2022.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I and IV only
(D) I, II, III and IV

**44.** The HAL Prachand, recently inducted into the Indian armed forces, is specifically designed as a:
(A) Heavy strategic bomber aircraft for long-range missions
(B) Light Combat Helicopter optimized for high altitudes
(C) Carrier-borne anti-submarine maritime patrol aircraft
(D) Unmanned combat aerial vehicle for reconnaissance strikes

**45.** What is the primary role of the HAL HTT-40 aircraft in the Indian Air Force?
(A) Basic flight training for pilots
(B) Mid-air aerial refueling operations
(C) Specialized VIP transport service
(D) Electronic intelligence gathering missions

**46.** The Saras aircraft, India's first indigenous multi-purpose civilian passenger aircraft, was designed and developed by which institution?
(A) Hindustan Aeronautics Limited (HAL)

Click Here to Buy book on Amazon

(B) Defence Research and Development Organisation (DRDO)
(C) National Aerospace Laboratories (NAL)
(D) Indian Space Research Organisation (ISRO)

**47.** The Arjun Main Battle Tank (MBT) incorporates a high-grade indigenous composite armour scheme. What is the specific name of this armour?
(A) Chobham armour
(B) Bhabha armour
(C) Kavach armour
(D) Kanchan armour

**48.** The Dhanush artillery gun, often referred to as the 'Desi Bofors', is heavily based on the designs of which imported weapon system?
(A) M777 howitzer
(B) K9 Vajra
(C) FH$_7$7B Bofors howitzer
(D) D-30 howitzer

**49.** The K9 Vajra-T is a 155mm/52 calibre tracked self-propelled howitzer. Which Indian private sector company assembled and manufactured it under a technology transfer agreement from South Korea?
(A) Tata Advanced Systems
(B) Larsen & Toubro (L&T)
(C) Mahindra Defence Systems
(D) Bharat Forge

**50.** Consider the following statements regarding the Pinaka system:
I. It is a Multi-Barrel Rocket Launcher (MBRL) system.
II. It was heavily utilized during the 1999 Kargil War to neutralize enemy positions on mountain peaks.
III. It can fire a salvo of 12 rockets in just 44 seconds.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**51.** The Advanced Towed Artillery Gun System (ATAGS) holds a unique record in its category. What is its notable achievement during trials?
(A) It achieved a record firing range over 48 km in its calibre class
(B) It is designed as the lightest towed artillery gun in its operational class
(C) It requires zero manual loading operations as it functions completely robotically
(D) It fires exclusively specialized laser-guided precision nuclear artillery shells

**52.** In naval terminology, what does the designation 'SSBN' stand for?
(A) Surface Ship Ballistic Nuclear
(B) Stealth Submarine Based Network
(C) Submersible Ship Ballistic Nuclear
(D) Strategic Submarine Bombardment Naval

**53.** INS Arihant is powered by a pressurized water reactor (PWR) developed with assistance from the Bhabha Atomic Research Centre (BARC). What kind of fuel does this reactor use?
(A) Enriched Uranium
(B) Natural Uranium
(C) Thorium
(D) Plutonium-239

**54.** Which is the second nuclear-powered ballistic missile submarine of the Arihant-class to be commissioned into the Indian Navy?
(A) INS Chakra
(B) INS Vagir
(C) INS Khanderi
(D) INS Arighaat

NODIA

**55.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The commissioning of INS Arihant completed India's nuclear triad.
**Reason (R):** A nuclear triad consists of the capability to launch nuclear weapons from land, air, and sea platforms.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**56.** Which indigenous submarine-launched ballistic missile (SLBM) is integrated into the armory of INS Arihant?
(A) Shaurya
(B) Nirbhay
(C) K-15 Sagarika
(D) Astra

**57.** What is the fundamental difference between an SSN (like the leased INS Chakra) and an SSBN (like INS Arihant)?

(A) An SSN is powered strictly by diesel engines, whereas an SSBN is entirely nuclear-powered.
(B) An SSN is meant for shallow coastal waters, whereas an SSBN operates only in deep open oceans.
(C) An SSN is built entirely in domestic shipyards, whereas an SSBN is always imported from abroad.
(D) An SSN is an attack submarine, whereas an SSBN carries nuclear ballistic missiles.

**58.** Under the 'Atmanirbhar Bharat' initiative in defence, the Ministry of Defence periodically issues "Positive Indigenization Lists". What is the primary implication of these lists?
(A) An import embargo applies to listed items beyond specified timelines.
(B) The items specified on the list will be imported with major tax subsidies.
(C) Foreign companies on the list are banned from doing business in India permanently.
(D) The items on the list can only be exported and not used by domestic forces.

**59.** The 'SRIJAN' portal was launched by the Ministry of Defence primarily for which purpose?
(A) To recruit and onboard Agniveer candidates into the armed forces
(B) To detail imported defence items for domestic indigenization
(C) To monitor real-time strategic locations of all active naval ships
(D) To distribute financial pension payments to ex-servicemen online

**60.** According to the Defence Acquisition Procedure (DAP) 2020, choose the correct priority order (highest to lowest) for capital acquisition categories:
(A) Buy (Global) > Buy (Indian) > Buy (Indian-IDDM)
(B) Buy (Indian-IDDM) > Buy (Indian) > Buy (Global)
(C) Buy (Indian) > Buy (Indian-IDDM) > Buy (Global)
(D) Buy (Global) > Buy (Indian-IDDM) > Buy (Indian)

**61.** What is the primary objective of the iDEX (Innovations for Defence Excellence) initiative?
(A) To foster defence innovation by engaging MSMEs, start-ups, and academia
(B) To import the most excellent defence technology equipment from global markets
(C) To provide low-interest housing and welfare loans for active defence personnel
(D) To streamline the export of agricultural products to foreign military bases abroad

**62.** The Defence Acquisition Council (DAC) is the highest decision-making body for capital acquisition in the Ministry of Defence. Who chairs the DAC?
(A) Chief of Defence Staff (CDS)
(B) National Security Advisor (NSA)
(C) Defence Minister
(D) Prime Minister

**63.** Match the Defence Public Sector Undertakings in List I with their headquarters in List II:
**List I: Defence Public Sector Undertaking**
P. Hindustan Aeronautics Limited (HAL)
Q. Bharat Electronics Limited (BEL)
R. Bharat Dynamics Limited (BDL)
S. Mishra Dhatu Nigam Limited (MIDHANI)
**List II: Headquarters**
1. Hyderabad
2. Bengaluru
3. Hyderabad
4. Bengaluru
(A) P-2, Q-4, R-1, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-3, R-2, S-1
(D) P-3, Q-1, R-4, S-2

**64.** Bharat Dynamics Limited (BDL) was established to act as the manufacturing base for which type of defence equipment?
(A) Naval warships and maritime vessels
(B) Heavy military transport aircraft
(C) Guided missiles and allied systems
(D) Armoured main battle tank platforms

**65.** Which DPSU is the lead integrator for the Akash surface-to-air missile system and specializes in defence electronics and radars?
(A) Hindustan Shipyard Limited (HSL)
(B) Bharat Electronics Limited (BEL)
(C) Bharat Earth Movers Limited (BEML)
(D) Garden Reach Shipbuilders (GRSE)

**66.** What is the specialized role of Mishra Dhatu Nigam Limited (MIDHANI) in India's defence and space sector?
(A) Manufacturing specialized solid rocket propellants and fuels
(B) Assembling heavy attack helicopters and

Downloaded from www.pdf.tube

combat aircraft
(C) Developing advanced cyber security network firewalls
(D) Supplying special metals, superalloys, and titanium

**67.** Consider the following statements regarding the role of Hindustan Aeronautics Limited (HAL):
I. It is responsible for the license production of the Su-30MKI in India.
II. It designed and manufactured the Light Utility Helicopter (LUH).
III. It is India's nodal agency for producing heavy artillery guns.
IV. It was instrumental in producing the HPT-32 Deepak trainer aircraft.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II, III and IV only
(D) I, III and IV only

**68.** Under the current Foreign Direct Investment (FDI) policy in the defence sector, what is the maximum limit of FDI allowed through the automatic route?
(A) 26%
(B) 49%
(C) 74%
(D) 100%

**69.** In the context of "Make in India" defence projects, what differentiates the 'Make-II' category from 'Make-I'?
(A) Make-II projects are industry-funded, whereas Make-I projects are government-funded.
(B) Make-II projects are reserved for foreign companies, whereas Make-I projects are for domestic entities.
(C) Make-II projects allow full 100% foreign investment, whereas Make-I projects strictly forbid it.
(D) Make-II projects are intended strictly for the Navy, whereas Make-I projects are for the Army.

**70.** What is the fundamental aim of the Strategic Partnership (SP) Model in defence procurement?
(A) To form binding strategic military alliances with foreign sovereign nations
(B) To fully privatize all existing Defence Public Sector Undertakings in India
(C) To permanently station foreign armed troops on domestic soil for joint training
(D) To partner with private firms to build platforms like submarines and fighter jets

NODIA

**71.** The C-295 transport aircraft manufacturing facility in Vadodara represents a major milestone. Why is this significant in India's defence production landscape?
(A) It is the first time a military aircraft will be directly imported without technology transfer.
(B) It is the first time a private firm (Tata) manufactures a full military aircraft in India.
(C) It marks HAL's largest joint venture initiative with an established European nation.
(D) It is a dedicated facility established for manufacturing specialized unguided munitions.

**72.** The Defence Testing Infrastructure Scheme (DTIS) aims to set up greenfield testing infrastructure in India. Who is expected to primarily utilize and benefit from these facilities?
(A) Only Defence Public Sector Undertakings (DPSUs)
(B) Foreign defence forces participating in joint exercises
(C) Domestic private sector defence industries and MSMEs
(D) The Indian Coast Guard exclusively

**73.** Recognizing the growing threat in the digital domain, the Indian Armed Forces established a tri-service agency to handle cyber warfare. What is its name?
(A) National Informatics Centre Cyber Wing
(B) Strategic Cyber Command
(C) Armed Forces IT Cell
(D) Defence Cyber Agency (DCyA)

**74.** In the context of cyber warfare, what is a "Zero-Day Exploit"?
(A) An attack exploiting an unpatched software vulnerability unknown to the vendor
(B) An attack scheduled and launched precisely at midnight across target networks
(C) A malware strain that deletes all system data, leaving zero bytes remaining
(D) A defensive network protocol that automatically resets all connections daily

**75.** Highly sensitive military networks are often protected from remote cyber attacks using a

technique called "Air-gapping". What does this mean?
(A) Transmitting all sensitive data via encrypted high-frequency radio waves in air
(B) Isolating a secure network physically from the internet and unsecured systems
(C) Storing critical defense data on secure military cloud servers in satellite orbit
(D) Automatically deleting all system and network operational logs every 24 hours

**76.** While CERT-In (Computer Emergency Response Team - India) handles civilian cyber incidents, which organization is designated as the nodal agency for responding to cyber security incidents in the Ministry of Defence?
(A) NCIIPC
(B) Defence CERT (CERT-In / Defence)
(C) DRDO Cyber Cell
(D) NTRO

**77.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Cyber warfare has blurred the traditional lines between war and peace.
**Reason (R):** Cyber attacks can be launched anonymously by state and non-state actors at any time, causing massive infrastructure damage without deploying military troops.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**78.** Which category of Unmanned Aerial Vehicle (UAV) is the indigenous Tapas BH-201 (formerly Rustom-II)?
(A) Hand-launched tactical micro drone
(B) High Altitude Long Endurance UAV
(C) Medium Altitude Long Endurance UAV
(D) Advanced stealth combat drone platform

**79.** How does a "loitering munition" (often called a kamikaze drone) primarily differ from a traditional reusable reconnaissance drone?
(A) It carries no onboard cameras, optical sensors, or electronic payloads.
(B) It is strictly operated and controlled by satellites in geostationary orbit.
(C) It is significantly larger in scale and takes off only from aircraft carriers.
(D) It hovers near a target and crashes into it with an explosive warhead.

**80.** The DRDO Lakshya is primarily utilized by the Indian Armed Forces for which specific purpose?
(A) As a heavy stealth bomber designed to penetrate enemy air defences
(B) To deliver essential emergency medical supplies in high-altitude areas
(C) As a reusable aerial target system for training crew personnel
(D) For conducting deep underwater reconnaissance and tracking missions

**81.** Consider the following statements regarding Anti-Drone technologies:
I. Soft-kill measures involve jamming the radio frequency or GPS signals of the drone.
II. Hard-kill measures physically destroy the drone using lasers, nets, or projectiles.
III. DRDO's counter-drone system only possesses hard-kill capabilities.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**82.** Which critical capability distinguishes a HALE (High Altitude Long Endurance) UAV from a MALE (Medium Altitude Long Endurance) UAV?
(A) HALE UAVs are designed to operate strictly in dense urban environments.
(B) HALE UAVs are powered exclusively by solar panel generator arrays.
(C) HALE UAVs cannot carry any operational payloads or surveillance sensors.
(D) HALE UAVs fly above 30,000 feet for days, giving broader coverage.

**83.** The basic principle of Radar (Radio Detection and Ranging) relies on the transmission and reflection of which type of electromagnetic waves?
(A) Radio waves or Microwaves
(B) X-rays
(C) Ultraviolet rays
(D) Gamma rays

**84.** In underwater warfare, what is the primary difference between Active Sonar and Passive Sonar?
(A) Active sonar is deployed strictly by attack

Click Here to Buy book on Flipkart

submarines, while passive sonar is used only by surface ships.
(B) Active sonar operates primarily using radio waves, while passive sonar uses acoustic sound waves in water.
(C) Active sonar emits sound pulses to listen for echoes, while passive sonar only listens to target sounds.
(D) Active sonar operates efficiently at high speeds, while passive sonar works only when the ship is stationary.

**85.** The Swathi system, successfully developed by DRDO and inducted into the Indian Army, is a type of:
(A) Weapon Locating Radar (WLR)
(B) Long-range surface-to-air missile
(C) Unmanned underwater vehicle
(D) Heavy lift helicopter

**86.** Modern fighter jets and advanced warships use AESA radar for superior tracking and jamming resistance. What does AESA stand for?
(A) Advanced Electromagnetic Sweep Antenna
(B) Airborne Early Strike Architecture
(C) Automated Emission Signal Amplifier
(D) Active Electronically Scanned Array

**87.** The DRDO 'Netra' system mounted on an Embraer aircraft is an indigenous example of an AEW&C system. What is the primary role of an AEW&C aircraft?
(A) To drop heavy precision-guided munitions on fortified enemy bunker positions
(B) To serve as airborne radar, detecting threats and guiding friendly fighters
(C) To transport fully equipped paratroopers behind enemy defense lines
(D) To perform specialized mid-air aerial refueling for tactical fighter jets

**88.** Arrange the following electromagnetic waves used in military applications in increasing order of their typical frequencies:
I. High Frequency (HF) radio waves
II. Infrared radiation
III. Microwaves used in radar
(A) I, III, II
(B) I, II, III
(C) III, I, II
(D) II, III, I

**89.** India officially adopted its formal Nuclear Doctrine in which year, following the recommendations of the National Security Advisory Board?
(A) 1998
(B) 1999
(C) 2003
(D) 2008

**90.** The cornerstone of India's nuclear doctrine is 'Credible Minimum Deterrence'. What does this concept essentially imply?
(A) Maintaining a minimum nuclear arsenal to deter enemies without triggering an arms race.
(B) Maintaining the largest and most powerful nuclear arsenal in the world to deter all potential enemies.
(C) Promising explicitly to deploy nuclear weapons first in response to any large-scale conventional war.
(D) Transferring strategic nuclear weapons to trusted allied countries to maintain regional security balance.

**91.** India's nuclear doctrine commits to a "No First Use" (NFU) policy against non-nuclear states. However, it reserves the right to use nuclear weapons first in response to a major attack involving which specific type of weapons?
(A) Conventional ballistic missiles
(B) Chemical or Biological weapons
(C) Cyber attacks on financial institutions
(D) Naval blockade of major ports

**92.** The series of five nuclear bomb test explosions conducted by India in 1998, which led to its declaration as a nuclear weapons state, is collectively known by which operational code name?
(A) Operation Smiling Buddha
(B) Operation Shakti
(C) Operation Parakram
(D) Operation Vijay

NODIA

**93.** Consider the following statements regarding the pillars of India's Nuclear Doctrine:
I. A posture of "No First Use".
II. Massive retaliation to inflict unacceptable damage if attacked with nuclear weapons.
III. Strict control of nuclear retaliation authorized only by the civilian political leadership.
IV. Open sharing of nuclear technology with non-nuclear neighboring states.
Which of the above statement(s) is/are correct?

(A) I, II and III only
(B) II, III and IV only
(C) I and III only
(D) I, II, III and IV

**94.** The management and administration of India's tactical and strategic nuclear weapons stockpile is executed by which specific organization?
(A) National Security Council Secretariat
(B) Defence Intelligence Agency
(C) Strategic Forces Command (SFC)
(D) Bhabha Atomic Research Centre

**95.** India's Nuclear Command Authority (NCA) consists of an Executive Council and a Political Council. Who chairs the Executive Council?
(A) Prime Minister
(B) Defence Minister
(C) Chief of Defence Staff
(D) National Security Advisor

**96.** Within the Nuclear Command Authority (NCA), the sole authority to authorize a nuclear retaliatory strike rests with the Political Council. Who chairs the Political Council?
(A) President of India
(B) Chief Justice of India
(C) Prime Minister of India
(D) Chief of Defence Staff

**97.** The Strategic Forces Command (SFC) functions under the operational purview of which higher command structure?
(A) The Chief of the Army Staff directly in operational command
(B) Chairman, Chiefs of Staff Committee (now CDS)
(C) The Director of the Intelligence Bureau during contingencies
(D) The Ministry of Home Affairs security committee

**98.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** In India, the nuclear button is firmly under civilian political control rather than military control.
**Reason (R):** This structure prevents accidental or unauthorized use of nuclear weapons by field commanders and aligns with global democratic norms.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

NODIA

**99.** To enhance border security and plug infiltration gaps, the Indian government is deploying CIBMS. What does CIBMS stand for?
(A) Comprehensive Integrated Border Management System
(B) Centralised Internal Border Monitoring System
(C) Coordinated Infantry Border Military Strategy
(D) Cyber-based International Border Measurement System

**100.** Project BOLD-QIT (Border Electronically Dominated QRT Interception Technique) was deployed to secure riverine borders where physical fencing is impossible. It was prominently implemented along the border with which country?
(A) Pakistan (in Gujarat)
(B) China (in Ladakh)
(C) Bangladesh (in Assam)
(D) Myanmar (in Manipur)

**101.** In modern border surveillance, aerostats are increasingly used. What is an aerostat in this context?
(A) A tethered blimp with radar and cameras to monitor ground areas
(B) A highly maneuverable stealth fighter jet aircraft used for air defence
(C) An underground acoustic sensor network deployed along border fencing
(D) A satellite placed in low earth orbit exclusively for border monitoring

**102.** Thermal imaging cameras used by border guarding forces like the BSF operate by detecting which type of radiation emitted by warm objects (like human bodies)?
(A) Ultraviolet radiation
(B) Gamma radiation
(C) X-ray radiation
(D) Infrared radiation

**103.** The P-8I Poseidon aircraft operated by the Indian Navy serves primarily as a:
(A) Heavy tactical transport aircraft designed for airborne paratroopers
(B) Long-range maritime patrol and anti-

submarine aircraft
(C) Supersonic long-range strategic strike bomber aircraft
(D) Close air support gunship aircraft for infantry support

**104.** In recent years, India has actively promoted defence exports. What is the Ministry of Defence's official defence export target to be achieved by the financial year 2024-25?
(A) ₹15,000 crore
(B) ₹35,000 crore
(C) ₹50,000 crore
(D) ₹1,00,000 crore

**105.** India achieved a major milestone in defence exports by signing a contract to export the BrahMos supersonic cruise missile. Which country was the first international buyer of this system?
(A) Vietnam
(B) Egypt
(C) Saudi Arabia
(D) Philippines

**106.** To streamline the issuance of defence export authorizations and No Objection Certificates (NOCs), the Department of Defence Production launched an online portal named:
(A) Open General Export License (OGEL) portal
(B) e-Raksha
(C) Niryat Mitra
(D) Bharat Vyapar

**107.** India's admission into which multilateral export control regime in 2017 significantly boosted its credentials to export high-end conventional arms and dual-use goods?
(A) Missile Technology Control Regime (MTCR)
(B) Wassenaar Arrangement
(C) Nuclear Suppliers Group (NSG)
(D) Australia Group

**108.** Consider the following statements regarding India's evolving defence export policy:
I. India extends Lines of Credit (LoC) to friendly foreign countries specifically to purchase Indian defence equipment.
II. Defence attaches stationed in Indian embassies are now mandated to actively promote Indian defence products.
III. India exports defence hardware strictly to NATO member countries.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**109.** DefExpo is a major defence exhibition organized by the Ministry of Defence. What is the typical frequency of this event?
(A) Held biennially (every two years)
(B) Held annually once every single calendar year
(C) Held once every three years on a triennial cycle
(D) Held once every five years on a quadrennial cycle

**110.** The 12th edition of DefExpo, held in 2022 and exclusively featuring Indian companies for the first time, was hosted in which city?
(A) Lucknow
(B) Chennai
(C) Gandhinagar
(D) New Delhi

**111.** While DefExpo focuses primarily on land, naval, and homeland security systems, which exhibition is Asia's premier aerospace and aviation exhibition held typically at Yelahanka Air Force Station?
(A) Wings India
(B) India Aviation
(C) Vayu Shakti
(D) Aero India

**112.** The underlying theme of DefExpo 2022 resonated strongly with the government's push for self-reliance. What was the exact theme?
(A) Digital Defence India
(B) Make in India for the World
(C) Path to Pride
(D) Emerging Cyber Threats

**113.** Which of the following is a key functional difference between a traditional military parade (like Republic Day) and a defence exhibition (like DefExpo)?
(A) Military parades showcase active service personnel, while defence exhibitions strictly prohibit military personnel from attending.
(B) Defence exhibitions are $B_2B$ technology platforms for networking and contracts, unlike ceremonial parades.
(C) Defence exhibitions showcase foreign military

Downloaded from www.pdf.tube

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

equipment, while ceremonial parades showcase exclusively indigenous equipment platforms.
(D) Ceremonial parades are organized by private corporate entities, while exhibitions are conducted solely by active armed forces units.

**114.** Match the Joint Military Exercises in List I with the participating partner country of India in List II:

**List I: Joint Military Exercise**
P. Surya Kiran
Q. Mitra Shakti
R. Yudh Abhyas
S. Garuda

**List II: Partner Country**
1. France
2. Nepal
3. Sri Lanka
4. United States of America

(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-2, R-1, S-4
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-4, R-3, S-1

**115.** The 'Malabar' exercise is a major multilateral naval exercise involving the navies of India, the United States, Japan, and which other country?
(A) Australia
(B) United Kingdom
(C) South Korea
(D) Singapore

**116.** Exercise Desert Knight, a bilateral air exercise involving Rafale fighter jets, was held between the Indian Air Force and the French Air and Space Force at which location in Rajasthan?
(A) Jaisalmer Air Force Station
(B) Suratgarh Air Force Station
(C) Jodhpur Air Force Station
(D) Nal (Bikaner) Air Force Station

**117.** The Mahajan Field Firing Range in Rajasthan regularly hosts international joint military exercises. Exercise 'Al-Najah', which has been held there, is a joint military exercise between India and which nation?
(A) Oman
(B) UAE
(C) Saudi Arabia
(D) Qatar

**118.** Choose the correct sequence of the following joint military exercises from purely bilateral to multilateral:
(A) Malabar Exercise → Surya Kiran → RIMPAC
(B) Surya Kiran → Malabar Exercise → RIMPAC
(C) RIMPAC → Surya Kiran → Malabar Exercise
(D) Surya Kiran → RIMPAC → Malabar Exercise

**119.** In modern warfare, what exactly defines a Directed-Energy Weapon (DEW)?
(A) A missile guided directly onto targets by a precision laser beam painted by ground forces.
(B) A system using focused energy (lasers or microwaves) to hit targets without projectiles.
(C) A traditional kinetic bomb platform equipped with an advanced satellite GPS guidance kit.
(D) An electronic warfare jamming pod mounted externally on a combat fighter aircraft.

**120.** DRDO has been actively working on a secretive project to develop a 100-kilowatt lightweight directed-energy weapon system (laser). What is the widely known codename of this project?
(A) SHIVA
(B) INDRA
(C) DURGA II
(D) AGNI-L

**121.** The KALI system, developed by BARC and DRDO, is often associated with directed-energy research. What is KALI primarily designed as?
(A) A specialized acoustic sonic weapon designed to disorient enemy ground troops in combat
(B) A space-based kinetic kill vehicle platform designed for orbital satellite destruction
(C) An underwater submarine sonar jamming device intended to neutralize enemy acoustic detection
(D) A linear accelerator emitting bursts of relativistic electrons and microwaves

**122.** Which of the following is considered a primary tactical advantage of a laser-based Directed-Energy Weapon over conventional anti-aircraft missiles?
(A) The beam travels at light speed for instant hits, and shot costs are extremely low.

NODIA

(B) It can easily bend its energy beam over the physical horizon to strike hidden enemy targets.
(C) It is entirely immune to environmental factors like heavy rain, fog, and atmospheric disturbances.
(D) It requires zero external electrical power sources or energy storage generators to operate continuously.

**123.** Consider the following systems in the context of Directed-Energy Weapons (DEWs):
I. High Energy Lasers (HEL)
II. High Power Microwaves (HPM)
III. Particle Beam Weapons
IV. Armour-Piercing Fin-Stabilized Discarding Sabot (APFSDS)
Which of the above statement(s) represents true forms of DEWs?
(A) I and II only
(B) I, II and III only
(C) II, III and IV only
(D) I, II, III and IV

**124.** Rajasthan's MSME and industrial policy heavily incentivizes investment in the defence sector. Which industrial cluster in Rajasthan has seen significant development of auto-components and defence-related manufacturing due to its proximity to the National Capital Region (NCR)?
(A) Bhilwara
(B) Alwar-Bhiwadi
(C) Banswara
(D) Chittorgarh

**125.** Which prominent defence research lab located in Rajasthan has heavily contributed to the development of indigenous water purification systems, camouflage patterns, and phase change materials for the armed forces?
(A) Defence Laboratory Jodhpur (DLJ)
(B) Terminal Ballistics Research Lab (TBRL)
(C) Proof and Experimental Establishment (PXE)
(D) Combat Vehicles Research and Development Establishment (CVRDE)

**126.** The Mahajan Field Firing Range, a critical infrastructure for testing heavy artillery and conducting international joint military exercises (like Austra Hind), is located in which district of Rajasthan?
(A) Jaisalmer
(B) Barmer
(C) Bikaner
(D) Sri Ganganagar

**127.** The Pokhran Test Range, famously known as the site for India's nuclear tests, provides an ideal geography due to sparse population and desert terrain. In which district of Rajasthan is it situated?
(A) Bikaner
(B) Jodhpur
(C) Churu
(D) Jaisalmer

**128.** In recent investment summits, the Rajasthan state government has pushed to integrate its local industries with the national defence supply chain. Which specific sector of MSMEs in Rajasthan provides a strong base for defence manufacturing?
(A) Textile printing and garment manufacturing
(B) Gemstone polishing and jewelry processing
(C) Precision engineering and metalworks
(D) Traditional handicrafts and clay pottery works

**129.** Arrange the following major military cantonments/stations in Rajasthan roughly in order from North to South geographically:
I. Suratgarh Military Station
II. Jodhpur Military Station
III. Bikaner Military Station
(A) I, III, II
(B) I, II, III
(C) III, I, II
(D) II, III, I

**130.** In recent Union Defence Budgets, to promote self-reliance, a specific percentage of the capital acquisition budget has been earmarked for domestic procurement. For FY 2023-24, what was this earmarked percentage?
(A) 40%
(B) 50%
(C) 68%
(D) 75%

**131.** The 'Agnipath' scheme was introduced primarily to modernize the armed forces' human resources. What is one of its major long-term fiscal impacts on the defence budget?
(A) It reduces pension costs, freeing funds for capital modernization.
(B) It sharply increases the long-term military

Click Here to Buy book on Amazon

pension liability of the central government.
(C) It redirects the national defence budget entirely toward purchasing foreign military weapons.
(D) It transfers the primary responsibility of paying military salaries to individual state governments.

**132.** In the Defence Budget, the allocation is broadly divided into Capital Outlay and Revenue Expenditure. Which of the following falls strictly under "Capital Outlay"?
(A) Regular payment of monthly salaries to active serving troops
(B) Operational maintenance and daily fuel expenses for transport trucks
(C) Procurement of new fighter jets and naval base construction
(D) Routine pension payments made directly to retired military personnel

**133.** A key modernization priority for the Indian Armed Forces is the creation of 'Integrated Theatre Commands'. What is the central purpose of this restructuring?
(A) To unify the three services under single geographical commands for joint operations.
(B) To separate the three military services completely so they never interact during peacetime.
(C) To bring all central paramilitary forces under the direct command of state police chiefs.
(D) To outsource military base security duties entirely to private military contractor firms.

**134.** To ensure that funds meant for military modernization do not lapse at the end of the financial year, the government conceptually agreed to create a special fund. What is it commonly referred to as?
(A) Rashtriya Raksha Kosh (RRK)
(B) PM CARES for Defence
(C) Strategic Reserve Fund
(D) Non-Lapsable Defence Modernisation Fund

**135.** In 2019, under 'Mission Shakti', India demonstrated its capability in a new domain of warfare. What exactly was achieved during this mission?
(A) First successful test of an offensive cyber weapon against a simulated civilian power grid.
(B) Successful test of an Anti-Satellite missile intercepting a low Earth orbit target.
(C) First successful launch of a crewed indigenous manned spacecraft into Earth orbit.
(D) Deployment of a high-energy laser weapon platform on an active naval destroyer ship.

**136.** Recognizing space as a critical military domain, the Indian Armed Forces established a specialized tri-service agency to manage space assets and operations. What is its name?
(A) Indian Space Research Organisation (ISRO)
(B) National Space Command
(C) Defence Space Agency (DSA)
(D) Military Orbital Bureau

NODIA

**137.** Which of the following represents a non-kinetic method of space warfare?
(A) Firing a kinetic ASAT missile to physically destroy an enemy satellite in space orbit.
(B) A satellite colliding deliberately with another target satellite to disable its systems.
(C) Dropping heavy conventional explosive bombs from orbit onto an enemy target city.
(D) Using lasers to blind satellite sensors or jamming communication signals.

**138.** The Outer Space Treaty of 1967, to which India is a signatory, places which major restriction on the militarization of space?
(A) It bans nuclear weapons and weapons of mass destruction in Earth orbit.
(B) It bans all military intelligence and reconnaissance satellites from operating in space orbit.
(C) It forbids the deployment and use of GPS satellite systems for military navigation purposes.
(D) It bans active astronauts with military background credentials from going into space missions.

**139.** Modern defense strategies frequently refer to 'Grey-zone warfare'. What does this term signify?
(A) Warfare operations conducted strictly in vast desert environments and arid border regions.
(B) Hostile actions (cyber-attacks, disinformation, proxies) below conventional war thresholds.
(C) Tactical combat operations carried out exclusively during twilight hours or complete night time.
(D) Strategic nuclear deterrence strategies relying exclusively on armed nuclear

submarine fleets.

**140.** While land, sea, air, and space are considered the first four domains of warfare, what is globally recognized by modern militaries as the 'Fifth Domain' of warfare?
(A) Economic warfare
(B) Cyberspace
(C) Psychological warfare
(D) Biological warfare

www.nodia.in

Downloaded from www.pdf.tube

# ANSWERS

**1.** (B) Technology that has both civilian commercial applications and military applications
Dual-use technology refers to equipment, software, or technology that can be utilized for both peaceful civilian purposes and military applications. Examples include nuclear energy technologies, advanced semiconductors, GPS systems, and specialized chemical compounds. Regulating dual-use items is critical for national security and international non-proliferation efforts to prevent unauthorized military proliferation worldwide.

**2.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Strategic autonomy requires a nation to maintain independent decision-making capabilities in geopolitical conflicts. Relying heavily on foreign nations for critical defence hardware creates vulnerabilities, as external suppliers can restrict arms flow, spare parts, or maintenance during crises. Developing indigenous manufacturing ensures operational readiness, reduces foreign supply leverage, and allows unhindered foreign policy execution during military engagements.

**3.** (A) Intelligence
The military acronym C4ISR stands for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance. The Intelligence element involves the collection, processing, analysis, and dissemination of critical information regarding enemy capabilities, movements, and operational environments. This comprehensive military architecture enables real-time situational awareness, rapid tactical decision-making, and seamless coordination across air, land, maritime, and cyber battlefields.

**4.** (C) Enhanced deterrent capability and reduction of foreign supply chain vulnerabilities
Developing indigenous defence technology allows a country to build self-reliant military forces that are not vulnerable to foreign embargoes, sanction regimes, or supply chain disruptions during conflict. Local production strengthens strategic deterrence by demonstrating sustained operational readiness, technological capability, and continuous equipment availability, while reducing long-term lifecycle maintenance costs and reliance on international original equipment manufacturers.

NODIA

**5.** (A) To require foreign suppliers to reinvest a set percentage into domestic industry
An offset clause in defence acquisition forces foreign suppliers to reinvest a specified percentage of the contract value into the purchasing nation's domestic defence industry. This mechanism encourages technology transfer, stimulates local manufacturing, creates high-skill employment, and strengthens local supply chains. Consequently, offsets assist developing defense ecosystems to transition from complete import dependence toward sustainable local production capabilities.

**6.** (B) 1958
The Defence Research and Development Organisation was established in 1958 by amalgamating the Defence Science Organisation with technical development establishments. Formed under the Ministry of Defence, its founding mission was to foster self-reliance in military systems. Over the decades, it expanded into a massive network of laboratories developing indigenous weapons, radars, missiles, avionics, and defensive technologies.

**7.** (A) I and II only
The Defence Research and Development Organisation was created in 1958 by combining the Defence Science Organisation with the Directorate of Technical Development & Production and the Technical Development Establishments. It was created directly under the Ministry of Defence, not the Ministry of Home Affairs, to design, develop, and innovate advanced defense technologies specifically tailored for the Indian Armed Forces.

**8.** (C) Balasya Mulam Vigyanam
The official Sanskrit motto of the Defence Research and Development Organisation is Balasya Mulam Vigyanam, which translates to the source of strength is science. This motto underscores the pivotal role of scientific research,

technological innovation, and indigenous engineering in establishing national security, military power, and strategic autonomy against modern operational challenges.

**9.** (D) Department of Defence Research and Development
The Defence Research and Development Organisation functions directly under the Department of Defence Research and Development, which is one of the specialized departments within the Ministry of Defence. The Secretary of this department serves concurrently as the Director General of the research organization, overseeing administrative policies, budgetary allocations, scientific projects, and research laboratory operations nationwide.

**10.** (A) DRDO develops technology, while DPSUs manufacture and integrate systems
The primary mandate of the Defence Research and Development Organisation centers on scientific research, design, and prototype development of indigenous weapon systems. Conversely, Defence Public Sector Undertakings like Hindustan Aeronautics Limited and Bharat Electronics Limited focus on large-scale industrial manufacturing, assembly, system integration, and production delivery of military platforms for operational deployment by armed services.

**11.** (A) P-3, Q-1, R-2, S-4
Prominent laboratories within the defence research network are situated across strategic military regions. Defence Laboratory Jodhpur is located in Rajasthan, focusing on desert technologies. Defence Electronics Application Laboratory operates from Dehradun, specializing in military communications. High Energy Materials Research Laboratory functions in Pune, researching energetic compounds, while Aeronautical Development Establishment operates out of Bengaluru, developing aircraft and drones.

**12.** (B) Camouflage, desert warfare technologies, and materials science
Located in Rajasthan, the Defence Laboratory Jodhpur focuses on research tailored to arid environments. Its primary operational domains encompass desert warfare technologies, camouflage schemes, radar-absorbing materials, radiation monitoring, and nuclear defense systems. Additionally, it conducts advanced materials science research, water desalination solutions, and protective clothing designed to ensure operational efficiency for armed forces operating in extreme desert conditions.

**13.** (A) Defence Electronics Research Laboratory (DLRL)
Located in Hyderabad, the Defence Electronics Research Laboratory specializes in the design and development of electronic warfare systems. It creates advanced radar warning receivers, signal intelligence apparatus, communications jamming systems, and electronic countermeasures. Systems like Samyukta and Divya Drishti were developed by this facility to enable electronic dominance and electromagnetic spectrum awareness for armed forces.

**14.** (C) IV only
The nuclear reactor powering INS Arihant was developed indigenously through extensive collaboration between the Bhabha Atomic Research Centre and the Defence Research and Development Organisation, assisted by local industry partners. It was not imported as a complete system from Russia. Other major indigenous projects including ATAGS artillery, Tapas drones, and Netra AEW&C systems were successfully developed by defence scientists.

**15.** (D) CVRDE - Naval submarine propulsion systems
The Combat Vehicles Research and Development Establishment, located in Avadi, Chennai, specializes in heavy tracked vehicles, main battle tanks, and armoured fighting platforms rather than naval submarine propulsion. It developed the Arjun Main Battle Tank and specialized military engineering vehicles. Naval physical and oceanographic laboratories handle submarine acoustic technologies and specialized underwater propulsion systems for maritime operations.

**16.** (C) A ballistic missile follows an unpowered parabolic arc, while a cruise missile is continuously powered and guided.
Ballistic missiles are propelled high into or beyond the atmosphere by rocket motors before following an unpowered, gravity-driven parabolic arc to their targets. In contrast, cruise missiles are jet-powered, continuously guided aerial vehicles that travel at lower atmospheric altitudes, remaining under constant power

Click Here to Buy book on Flipkart

throughout their controlled flight path, similar to unmanned jet aircraft.

**17.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Cruise missiles fly at extremely low altitudes, closely following terrain contours to remain beneath the coverage line of terrestrial early-warning radars. Ballistic missiles travel along high-altitude parabolic trajectories, making them detectable by long-range tracking systems early in flight. Flying within the radar horizon gap allows cruise missiles to evade prompt detection and air defense response measures effectively.

**18.** (D) Ballistic missiles exit the atmosphere where no ambient oxygen exists
Ballistic missiles achieve high altitudes, reaching upper atmospheric layers or outer space where oxygen is virtually absent. Consequently, their rocket engines must carry both fuel and an internal oxidizer to achieve combustion. Most cruise missiles remain inside the atmosphere, using air-breathing jet engines like turbofans or ramjets that harvest ambient atmospheric oxygen to burn onboard liquid fuel.

**19.** (A) P-4, Q-1, R-2, S-3
Missile speed regimes are defined by Mach numbers relative to the speed of sound. Subsonic cruise missiles travel below Mach 1, while supersonic cruise missiles operate between Mach 1 and Mach 3. Hypersonic weapons fly above Mach 5 using advanced air-breathing engines. Reentry vehicles of intercontinental ballistic missiles attain extreme velocities exceeding Mach 15 during atmospheric re-entry.

**20.** (C) Ramjet engine
A ramjet engine is an air-breathing jet propulsion system that uses the forward motion of the vehicle to compress incoming air without a mechanical compressor. Operating efficiently only at supersonic speeds, ramjets require initial acceleration boosters. They are widely utilized in high-speed cruise missiles to sustain continuous supersonic flight across atmospheric target operational zones.

**21.** (A) Multi-stage missiles shed their empty booster stages to reduce weight and increase overall range.
Multistage ballistic missiles maximize range and velocity by shedding expended rocket stages and empty fuel tanks during ascent. Discarding unnecessary mass allows remaining engines to accelerate the lighter vehicle more efficiently. Single-stage configurations are inadequate for intercontinental distances, while solid-propellant boosters generally burn continuously until burnout without the capability to easily stop and restart in flight.

**22.** (D) Russia
The BrahMos missile system is developed by BrahMos Aerospace, a joint venture between India's Defence Research and Development Organisation and Russia's NPO Mashinostroyeniya. Derived from the Russian P-800 Oniks, BrahMos is named after the Brahmaputra and Moskva rivers. It represents one of the world's fastest supersonic operational cruise missiles deployed across land, sea, and air platforms.

**23.** (C) 5,000 to 5,500 km or more
Agni-V is an indigenously developed, three-stage, solid-fueled Intercontinental Ballistic Missile featuring a operational range exceeding 5,000 to 5,500 kilometers. Incorporating advanced avionics, composite rocket motors, and Multiple Independently Targetable Re-entry Vehicle capabilities, it provides India with long-range strategic deterrence capabilities across vast geographical distances, reinforcing national security and strategic stability.

**24.** (C) Medium-range surface-to-air missile
Akash is an indigenous medium-range surface-to-air missile system engineered to protect mobile military formations and strategic installations from aerial threats. Powered by a ramjet propulsion engine, Akash can simultaneously engage multiple enemy targets, such as fighter aircraft, cruise missiles, and drones, utilizing automated command guidance and advanced phased-array radar monitoring systems.

**25.** (A) I and II only
Prithvi was India's first indigenously developed short-range surface-to-surface ballistic missile under the integrated missile program. Driven by liquid propulsion engines, it was designed for tactical battlefield strikes. Prithvi missiles are fully nuclear-capable platforms integrated into the strategic forces, rendering any claim that they cannot carry nuclear warheads completely inaccurate within national defence operations.

Downloaded from www.pdf.tube

**26.** (A) I, II and III only
BrahMos is a supersonic cruise missile operating on a fire-and-forget principle, traveling at speeds between Mach 2.8 and 3.0. It features full multi-platform launch capability across land, naval vessels, submarines, and fighter jet platforms. It was not developed exclusively as an air-to-air weapon, but primarily as an anti-ship and land-attack strike system.

**27.** (A) III, I, IV, II
The Agni series of ballistic missiles increases in operational range sequentially across designated variants. Agni-I features a range of roughly 700 to 900 kilometers, followed by Agni-II at 2,000 to 3,000 kilometers. Agni-IV extends operational reach up to 4,000 kilometers, whereas Agni-V serves as an intercontinental ballistic missile exceeding 5,000 kilometers range.

**28.** (B) Astra
Astra is an indigenous Beyond-Visual-Range air-to-air missile designed for deployment on tactical fighter aircraft like the Su-30MKI and Tejas. Unlike Prithvi, Agni, and Shaurya, which are surface-to-surface ballistic or quasi-ballistic missile systems, Astra is specifically engineered to engage and destroy hostile enemy aircraft in aerial combat scenarios across varying operational altitudes.

**29.** (A) Dr. A.P.J. Abdul Kalam
The Integrated Guided Missile Development Programme was conceived and directed by Dr. A.P.J. Abdul Kalam during his tenure at the Defence Research and Development Organisation. Initiated in 1983, this flagship initiative sought to establish self-reliance in missile technology, successfully developing five core missile platforms that transformed national strategic defence and indigenous technological capabilities.

**30.** (C) 2008
Formally launched in 1983, the Integrated Guided Missile Development Programme successfully achieved its core technological objectives and was officially declared completed by the Ministry of Defence in 2008. The initiative resulted in operational deployment of foundational missile systems, enabling indigenous self-reliance and laying the technological baseline for next-generation advanced strike and defense programs.

**31.** (D) Prithvi, Agni, Trishul, Akash, Nag
The Integrated Guided Missile Development Programme was sanctioned to develop five distinct missile systems tailored for critical operational roles: Prithvi (surface-to-surface short-range), Agni (surface-to-surface intermediate-range demonstrator), Trishul (short-range surface-to-air), Akash (medium-range surface-to-air), and Nag (fire-and-forget anti-tank missile). Together, these platforms formed the bedrock of indigenous missile warfare capabilities.

**32.** (C) Trishul
Trishul was a short-range, quick-reaction surface-to-air missile developed under the missile program to counter low-flying missiles and aircraft. Facing persistent technical issues and development delays, the Ministry of Defence de-linked Trishul from operational induction requirements, directing its technology to serve primarily as a technological demonstrator for future surface-to-air defense platforms.

NODIA

**33.** (B) Anti-tank operations
Nag is a third-generation, fire-and-forget anti-tank guided missile developed to engage heavily armoured enemy vehicles and main battle tanks in all-weather conditions. Equipped with advanced imaging infrared seekers, Nag can destroy enemy armour fitted with explosive reactive armour, operating from land-based tracked vehicle carriers or specialized helicopter platforms like the Helina.

**34.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
In the early 1980s, India faced strict international technology denial regimes, including the Missile Technology Control Regime, which restricted access to foreign missile systems and components. To overcome these strategic sanctions and secure self-reliance, the Indian government sanctioned the Integrated Guided Missile Development Programme, fostering comprehensive indigenous research, design, and manufacturing capabilities.

**35.** (A) Project 15B stealth destroyers
INS Visakhapatnam, INS Mormugao, INS Imphal, and INS Surat represent the Visakhapatnam-class stealth guided-missile destroyers built under Project 15B. Constructed by Mazagon Dock Shipbuilders Limited, these frontline warships feature high indigenous content, advanced stealth features, modern radar

systems, automated network-centric combat management, and lethal surface-to-surface and surface-to-air missile weapons suites.

**36.** (A) P-3, Q-2, R-1, S-4
Modern Indian Navy procurement projects correspond to specific vessel classes. Project 17A covers Nilgiri-class stealth frigates, while Project 28 comprises Kamorta-class anti-submarine warfare corvettes. Project 75 involves the construction of diesel-electric Scorpene-class (Kalvari-class) submarines, whereas Project 15A refers to Kolkata-class guided-missile destroyers, ensuring specialized operational capabilities across maritime theaters.

**37.** (A) I and II only
INS Vikrant is India's first indigenously designed and built aircraft carrier, constructed at Cochin Shipyard Limited in Kochi. It utilizes a Short Take-Off But Arrested Recovery system featuring an angled ski-jump runway for launching conventional fixed-wing fighter aircraft, rather than operating exclusively with vertical take-off aircraft or lacking ski-jump structures.

**38.** (D) Shivalik class
The Shivalik class, developed under Project 17, represents India's first indigenous class of multi-role stealth frigates. Built by Mazagon Dock Limited, these warships incorporated advanced structural stealth design, reduced radar cross-section signatures, acoustic damping features, and low infrared footprints, setting a benchmark for future surface warship construction within the Indian Navy.

**39.** (B) Diesel-electric attack submarines
INS Kalvari, INS Khanderi, and INS Karanj are advanced diesel-electric attack submarines constructed under Project 75 at Mazagon Dock Shipbuilders Limited in collaboration with France. Belonging to the Kalvari (Scorpene) class, these stealthy vessels perform anti-surface warfare, anti-submarine combat, intelligence gathering, mine laying, and area surveillance in littoral and ocean blue waters.

**40.** (C) Kolkata
Garden Reach Shipbuilders & Engineers is a premier Defence Public Sector Undertaking under the Ministry of Defence, headquartered in Kolkata, West Bengal. Renowned for warship construction, GRSE builds landing craft, patrol vessels, stealth frigates, and anti-submarine corvettes, playing a crucial role in fulfilling the Indian Navy's indigenization and fleet expansion mandates.

**41.** (B) 4th / 4.5 generation
The HAL Tejas is a lightweight, multi-role, single-engine supersonic fighter aircraft classified as a 4.5-generation combat plane. Featuring a compound delta-wing design, advanced glass cockpit, fly-by-wire flight control system, multi-mode radar, and composite structure materials, Tejas replaces older fighter fleets, providing agile air defense and ground-attack operational capabilities.

**42.** (A) Aeronautical Development Agency (ADA)
The Aeronautical Development Agency, established under the Department of Defence Research and Development, acts as the primary nodal agency for designing and monitoring the Light Combat Aircraft program. While Hindustan Aeronautics Limited serves as the primary industrial manufacturing agency, ADA oversees overall design architecture, system integration, software development, and flight-testing coordination.

**43.** (A) I, II and III only
India's Advanced Medium Combat Aircraft project aims to develop a fifth-generation, twin-engine, stealth fighter jet featuring internal weapons bays, radar-absorbing materials, and supercruise capability. Designed by the Aeronautical Development Agency, the platform is currently under active design and prototyping phases, meaning it has not yet seen full induction into service.

**44.** (B) Light Combat Helicopter optimized for high altitudes
HAL Prachand is an indigenously developed Light Combat Helicopter engineered specifically for high-altitude combat deployments, such as the Siachen Glacier and Eastern Ladakh. Powered by Shakti engines, Prachand features high maneuverability, integrated weapon systems, digital avionics, and stealth characteristics, providing ground support and anti-armour capabilities at extreme operational elevations.

**45.** (A) Basic flight training for pilots
The HAL HTT-40 is an indigenously designed and manufactured tandem seat basic trainer

Click Here to Buy book on Amazon

aircraft developed by Hindustan Aeronautics Limited. Intended to replace aging trainer fleets, the HTT-40 is equipped with modern glass cockpit avionics, aerobatic capabilities, and user-friendly handling characteristics designed specifically for stage-I flight training of military pilots.

**46.** (C) National Aerospace Laboratories (NAL)
Saras is India's first indigenous multi-purpose civilian light transport passenger aircraft, developed by National Aerospace Laboratories, a constituent laboratory of the Council of Scientific and Industrial Research in Bengaluru. Designed for regional connectivity, remote transport, and aerial surveillance, Saras represents a key domestic milestone in civil aviation research and development.

**47.** (D) Kanchan armour
The Arjun Main Battle Tank uses Kanchan composite armour, an indigenous protective scheme developed by the Defence Metallurgical Research Laboratory. Comprising composite materials sandwiched between steel plates, Kanchan armour provides exceptional resistance against modern anti-tank kinetic energy penetrators and high-explosive anti-tank rounds, greatly improving crew survivability on the battlefield.

**48.** (C) FH$_7$7B Bofors howitzer
The Dhanush artillery gun is an indigenous 155mm/45 calibre towed howitzer developed by Advanced Weapons and Equipment India Limited. Based on the technical blueprints of the imported Swedish FH$_7$7B Bofors howitzer acquired in the 1980s, Dhanush features upgraded electronic sights, automated laying systems, enhanced range, and improved accuracy.

**49.** (B) Larsen & Toubro (L&T)
The K9 Vajra-T is a 155mm/52 calibre tracked self-propelled howitzer assembled and manufactured in India by Larsen & Toubro at Hazira, Gujarat. Built under a technology transfer agreement with Hanwha Aerospace of South Korea, this platform provides artillery support with rapid mobility, high rate of fire, and armored crew protection.

**50.** (D) I, II and III
Pinaka is an indigenous Multi-Barrel Rocket Launcher system developed by DRDO. Proving its precision and high rate of fire during the 1999 Kargil War by neutralizing fortified high-altitude enemy positions, Pinaka can launch a complete salvo of 12 high-explosive rockets in 44 seconds, delivering rapid neutralization of tactical ground targets.

**51.** (A) It achieved a record firing range over 48 km in its calibre class
The Advanced Towed Artillery Gun System is a 155mm/52 calibre towed artillery piece developed by DRDO in collaboration with private industry partners. During developmental firing trials, ATAGS set a global distance record in its category by successfully striking targets at an extended range exceeding 48 kilometers using specialized ammunition.

**52.** (C) Submersible Ship Ballistic Nuclear
In naval designation systems, SSBN stands for Submersible Ship Ballistic Nuclear. This specific acronym denotes a nuclear-powered submarine capable of carrying and launching nuclear-armed ballistic missiles. SSBNs constitute the sea-based leg of a nation's strategic nuclear triad, offering survivable second-strike capabilities due to their continuous underwater endurance and stealth.

NODIA

**53.** (A) Enriched Uranium
The compact nuclear reactor powering INS Arihant operates using enriched uranium fuel, specifically designed to utilize uranium enriched in the isotope Uranium-235. Developed with critical technical assistance from the Bhabha Atomic Research Centre, this pressurized water reactor generates steam to power propulsion turbines, enabling continuous high-speed submerged operations without atmospheric refueling.

**54.** (D) INS Arighaat
INS Arighaat is the second nuclear-powered ballistic missile submarine of the Arihant class commissioned into the Indian Navy. Built indigenously under the Advanced Technology Vessel project at Visakhapatnam, Arighaat reinforces India's nuclear triad alongside INS Arihant, significantly enhancing continuous maritime strategic deterrence, underwater stealth capabilities, and operational readiness.

**55.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
A nuclear triad refers to the strategic military capability of launching nuclear strikes from land-based missiles, strategic bombers, and sea-based submarines. The commissioning of the submarine INS Arihant provided India with a stealthy underwater nuclear delivery platform, successfully completing the sea-based leg and cementing the triad architecture for minimum credible deterrence.

**56.** (C) K-15 Sagarika
The K-15 Sagarika is an indigenous submarine-launched ballistic missile developed by DRDO to equip Arihant-class nuclear submarines. Possessing an operational range of roughly 750 kilometers, Sagarika provides underwater strike capabilities, forming a core component of India's sea-based second-strike nuclear deterrence strategy operated by the Strategic Forces Command.

**57.** (D) An SSN is an attack submarine, whereas an SSBN carries nuclear ballistic missiles.
Although both submarine types feature nuclear propulsion providing long underwater endurance, their operational roles differ fundamentally. An SSN is a nuclear-powered attack submarine designed to hunt surface warships, intercept submarines, and launch conventional cruise missiles. An SSBN is a strategic platform specifically armed with long-range nuclear ballistic missiles for nuclear deterrence.

**58.** (A) An import embargo applies to listed items beyond specified timelines.
Under the Atmanirbhar Bharat initiative, Positive Indigenization Lists issued by the Ministry of Defence specify military equipment, weapon systems, and components that are barred from foreign import after designated deadlines. These embargos mandate that armed services procure these items strictly from domestic public and private defense manufacturers, boosting indigenous capability.

**59.** (B) To detail imported defence items for domestic indigenization
The SRIJAN portal was established by the Department of Defence Production to promote indigenization in defense manufacturing. It displays detailed information about defense items, sub-systems, and components currently imported by Defence Public Sector Undertakings and Armed Forces, allowing private domestic industries, start-ups, and MSMEs to design and manufacture them locally.

**60.** (B) Buy (Indian-IDDM) > Buy (Indian) > Buy (Global)
The Defence Acquisition Procedure 2020 prioritizes capital procurement categories to maximize domestic content and local innovation. The highest preference is accorded to Buy (Indian-Indigenously Designed, Developed and Manufactured), followed sequentially by Buy (Indian), Buy and Make (Indian), and finally Buy (Global) as the lowest priority, ensuring maximum self-reliance in defense procurement.

**61.** (A) To foster defence innovation by engaging MSMEs, start-ups, and academia
Innovations for Defence Excellence was launched to foster innovation and technological development in defence and aerospace sectors. It engages micro, small, and medium enterprises, start-ups, individual innovators, and academic institutions, providing grants, incubation support, and technical guidance to create cutting-edge indigenous technologies tailored for deployment by armed forces.

**62.** (C) Defence Minister
The Defence Acquisition Council is the highest decision-making body within the Ministry of Defence for capital procurement policies, strategic acquisitions, and long-term force modernization plans. Chaired directly by the Union Defence Minister, the council evaluates procurement proposals, accords Approvals of Necessity, and ensures speedy execution of equipment requirements for armed forces.

**63.** (A) P-2, Q-4, R-1, S-3
Defence Public Sector Undertakings maintain central administrative headquarters across key industrial cities. Both Hindustan Aeronautics Limited and Bharat Electronics Limited are headquartered in Bengaluru, Karnataka. Conversely, Bharat Dynamics Limited, which focuses on missile manufacturing, and Mishra Dhatu Nigam Limited, which produces superalloys, are headquartered in Hyderabad, Telangana.

Downloaded from www.pdf.tube

**64.** (C) Guided missiles and allied systems
Bharat Dynamics Limited was established in 1970 in Hyderabad to serve as the primary manufacturing base for India's guided missile systems. BDL manufactures surface-to-air missiles, anti-tank guided missiles, air-to-air weapons, underwater torpedoes, and countermeasures equipment for the armed forces, collaborating closely with DRDO and international original equipment manufacturers.

**65.** (B) Bharat Electronics Limited (BEL)
Bharat Electronics Limited is a Navratna public sector enterprise specializing in advanced electronic equipment for defense and civilian sectors. BEL serves as the primary system integrator for the Akash surface-to-air missile system and manufactures sophisticated naval sonars, tactical radars, night vision devices, electronic warfare systems, and military communications hardware.

**66.** (D) Supplying special metals, superalloys, and titanium
Mishra Dhatu Nigam Limited is a specialized Defence Public Sector Undertaking in Hyderabad that manufactures critical materials, including superalloys, titanium alloys, special steels, and magnetic alloys. MIDHANI plays an indispensable supporting role by providing high-performance materials required for advanced aerospace platforms, missile engines, nuclear reactors, space rockets, and armoured vehicles.

**67.** (A) I, II and IV only
Hindustan Aeronautics Limited is India's principal aerospace manufacturer, producing fighter jets like the Su-30MKI under Russian license, developing Light Utility Helicopters, and building trainer platforms like the HPT-32 Deepak. Heavy artillery guns are manufactured by specialized ordnance and private gun facilities, not HAL, which focuses strictly on aeronautics.

**68.** (C) 74%
Under the updated Foreign Direct Investment policy for defence manufacturing, foreign investment up to 74% is permitted via the automatic route without requiring prior government approval. Proposals exceeding 74% are eligible up to 100% through the government route, provided they grant access to modern technology or offer other strategic justification.

**69.** (A) Make-II projects are industry-funded, whereas Make-I projects are government-funded.
Under the Defence Acquisition Procedure, the Make-I procurement category involves projects funded by the government up to 70% for prototype development. In contrast, the Make-II category consists of industry-funded projects designed for indigenization, prototype development, and import substitution where private developers bear development costs without government financial funding.

**70.** (D) To partner with private firms to build platforms like submarines and fighter jets
The Strategic Partnership Model within defense acquisition policies aims to institutionalize partnerships between domestic private industries and global original equipment manufacturers. Private Indian firms are designated as Strategic Partners to construct major defence platforms, including submarines, fighter aircraft, helicopters, and armoured vehicles locally through long-term technology transfer agreements.

**71.** (B) It is the first time a private firm (Tata) manufactures a full military aircraft in India.
The C-295 transport aircraft project in Vadodara marks a watershed moment in Indian aviation history, establishing the first private sector final assembly line for military aircraft. Executed by Tata Advanced Systems in collaboration with Airbus, it breaks the monopoly of public sector undertakings in military aircraft manufacturing within India.

**72.** (C) Domestic private sector defence industries and MSMEs
The Defence Testing Infrastructure Scheme aims to establish greenfield defence testing facilities across domestic industrial corridors. Because establishing specialized test facilities requires substantial capital investment, DTIS provides financial assistance to lower testing barriers, enabling private defense manufacturing firms, start-ups, and MSMEs to access state-of-the-art testing infrastructure affordably.

**73.** (D) Defence Cyber Agency (DCyA)
The Defence Cyber Agency is a specialized tri-service command established to handle cyber threats, protect military information networks, and execute offensive and defensive cyber operations. Staffed by personnel from the Army, Navy, and Air Force, DCyA coordinates

NODIA

joint military cyber doctrines and counters sophisticated state-sponsored cyber warfare threats against defense assets.

**74.** (A) An attack exploiting an unpatched software vulnerability unknown to the vendor
A Zero-Day Exploit refers to a cyber attack targeting a software vulnerability that is unknown to the software developer or vendor. Because no patch or protective defense exists at the time of discovery, developers have zero days to mitigate the security breach, making such exploits highly effective tools for military cyber operations.

**75.** (B) Isolating a secure network physically from the internet and unsecured systems
Air-gapping is a network security measure where a secure computer or local network is physically isolated from unsecured networks, including the public internet. By preventing direct physical or wireless connections, air-gapped military networks effectively prevent unauthorized remote cyber infiltration, malware distribution, data theft, and external operational command tampering.

**76.** (B) Defence CERT (CERT-In / Defence)
Within the Ministry of Defence, Defence CERT operates as the specialized nodal agency responsible for monitoring, identifying, and responding to cyber security incidents affecting defense networks. Operating in alignment with national cyber security frameworks, Defence CERT ensures continuous threat intelligence sharing, Incident mitigation, and vulnerability remediation across military computing infrastructure.

**77.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Cyber warfare allows state and non-state actors to conduct covert operations anonymously without physical force projection or troop movements. Attacks targeting power grids, military communications, and financial networks can inflict immense strategic damage during peacetime, effectively blurring the clear boundary that historically separated formal state warfare from peacetime relations.

**78.** (C) Medium Altitude Long Endurance UAV
Tapas BH-201, formerly designated as Rustom-II, is an indigenously developed Medium Altitude Long Endurance Unmanned Aerial Vehicle designed by DRDO. Operating at altitudes up to 30,000 feet with long endurance, Tapas carries electro-optical payloads, synthetic aperture radars, and signal intelligence sensors for real-time intelligence, surveillance, and reconnaissance missions.

**79.** (D) It hovers near a target and crashes into it with an explosive warhead.
A loitering munition, commonly called a kamikaze or suicide drone, combines features of surface missiles and unmanned aerial platforms. It loiters over a targeted combat area for extended periods searching for targets, then executes a deliberate dive into the target, detonating its integrated explosive payload upon impact, destroying itself entirely.

**80.** (C) As a reusable aerial target system for training crew personnel
DRDO Lakshya is an indigenously developed pilotless, reusable aerial target system powered by a variable thrust jet engine. Launched from land or ships, Lakshya acts as a high-speed subscale target to train air defence missile crews, gunners, and combat pilot units in tracking and destroying realistic airborne threats.

**81.** (A) I and II only
Counter-drone systems combine soft-kill and hard-kill techniques. Soft-kill measures disrupt command links using radio frequency jamming, spoofing, or cyber countermeasures. Hard-kill methods physically neutralize drones using kinetic projectiles, laser weapons, or capture nets. DRDO's integrated counter-drone technology incorporates both soft-kill electronic jammers and hard-kill laser capabilities.

**82.** (D) HALE UAVs fly above 30,000 feet for days, giving broader coverage.
High Altitude Long Endurance unmanned aerial vehicles operate at altitudes exceeding 30,000 to 50,000 feet with continuous flight endurances lasting over 24 hours. This high altitude capability allows HALE platforms to survey vast geographic regions, perform persistent maritime reconnaissance, and gather electronic intelligence across much wider operational areas than MALE drones.

Click Here to Buy book on Flipkart

**83.** (A) Radio waves or Microwaves
Radar systems operate by transmitting high-frequency radio waves or microwave signals toward target areas and analyzing the reflected echoes returning from distant objects. By processing signal travel time, Doppler shifts, and return angles, radar systems calculate the precise range, altitude, speed, and directional trajectory of aircraft, surface ships, and terrain features.

**84.** (C) Active sonar emits sound pulses to listen for echoes, while passive sonar only listens to target sounds.
Sonar systems use acoustic underwater sound propagation to detect submerged objects. Active sonar transmits acoustic sound pulses (pings) into the water and measures the reflected echoes to determine a target's precise range and position. Conversely, passive sonar listens silently to acoustic noise emitted by target propulsion systems, avoiding position disclosure.

**85.** (A) Weapon Locating Radar (WLR)
Swathi is an indigenous Weapon Locating Radar developed by DRDO and manufactured by Bharat Electronics Limited. Using advanced phased-array technology, Swathi detects and tracks incoming artillery shells, mortars, and rockets, calculating their exact launch positions back to the source to allow rapid counter-battery fire by friendly artillery units.

**86.** (D) Active Electronically Scanned Array
AESA stands for Active Electronically Scanned Array. Unlike conventional mechanically steered radars, AESA uses thousands of individual solid-state transmit/receive modules to steer radar beams electronically at extreme speeds. This technology provides enhanced multi-target tracking, extended detection range, low probability of intercept, and superior resistance to electronic jamming efforts.

**87.** (B) To serve as airborne radar, detecting threats and guiding friendly fighters
Airborne Early Warning and Control systems act as force multipliers in modern air combat. Operating on platforms like Netra, these airborne radars detect hostile aircraft, cruise missiles, and drones at long ranges, providing total situational awareness, managing airspace, and directing friendly combat aircraft to intercept incoming aerial threats effectively.

**88.** (A) I, III, II
The electromagnetic spectrum arranges radiation by frequency and wavelength. High Frequency (HF) radio waves possess the lowest frequencies among these options (3 to 30 MHz). Microwaves utilized in radar systems operate at higher frequencies (1 to 100 GHz). Infrared radiation possesses higher frequencies than microwaves, occupying the spectrum just below visible light.

NODIA

**89.** (C) 2003
Following the 1998 Pokhran-II tests and subsequent recommendations by the National Security Advisory Board, the Cabinet Committee on Security formally approved and released India's official Nuclear Doctrine in January 2003. This doctrine established key operational guidelines, command control structures, and strategic policies governing the posture and employment of nuclear weapons.

**90.** (A) Maintaining a minimum nuclear arsenal to deter enemies without triggering an arms race.
Credible Minimum Deterrence is the core principle of India's strategic policy. It dictates maintaining a sufficient, survivable, and technologically reliable nuclear force to deter potential adversaries from launching nuclear attacks. Rather than matching rival arsenals numerical count, it emphasizes guaranteed retaliatory destruction while avoiding costly, destabilizing international nuclear arms races.

**91.** (B) Chemical or Biological weapons
India maintains a strict No First Use policy regarding nuclear weapons against nuclear and non-nuclear weapon states. However, the doctrine explicitly contains a key contingency: in the event of a major attack against India or its armed forces using chemical or biological weapons, India retains the option of launching nuclear retaliation.

**92.** (B) Operation Shakti
Operation Shakti was the operational codename for the series of five nuclear test explosions conducted by India at the Pokhran Test Range in Rajasthan in May 1998. Led by scientists from BARC and DRDO, these successful tests demonstrated detonation capabilities for fission and thermonuclear devices, declaring India a nuclear weapons state.

**93.** (A) I, II and III only
The key pillars of India's Nuclear Doctrine include maintaining a No First Use posture, building credible minimum deterrence, threatening massive retaliation to inflict unacceptable damage if attacked, and placing authorization strictly under civilian political leadership. Sharing sensitive nuclear technology or weapons with non-nuclear neighboring states is completely excluded from strategic doctrines.

**94.** (C) Strategic Forces Command (SFC)
The Strategic Forces Command, created in 2003, is a specialized tri-service military organization responsible for managing, maintaining, and operationalizing India's nuclear weapons stockpile. Functioning under the Nuclear Command Authority, SFC oversees nuclear delivery platforms, missile units, and operational deployment strategies to ensure credible and responsive nuclear deterrence capabilities.

**95.** (D) National Security Advisor
India's Nuclear Command Authority is divided into an Executive Council and a Political Council. The Executive Council is chaired directly by the National Security Advisor. It evaluates strategic threat environments, reviews operational readiness, and provides inputs to the Political Council, which retains sole decision-making power regarding nuclear weapon employment authorization.

**96.** (C) Prime Minister of India
Within the structure of the Nuclear Command Authority, the Political Council holds sole power to authorize a nuclear retaliatory strike. The Political Council is chaired by the Prime Minister of India. This arrangement guarantees complete civilian political control over strategic nuclear deployment, upholding constitutional supremacy and democratic oversight during national security crises.

**97.** (B) Chairman, Chiefs of Staff Committee (now CDS)
The Strategic Forces Command operates under the operational command and administrative oversight of the Chairman, Chiefs of Staff Committee, a role now embodied by the Chief of Defence Staff. This tri-service command structure ensures unified operational control, inter-service coordination, and seamless integration of strategic nuclear assets across land, air, and naval delivery platforms.

**98.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
In accordance with democratic principles, authority over nuclear weapons in India is vested exclusively in the civilian political leadership headed by the Prime Minister. This robust command structure prevents unauthorized military action, reduces risks of accidental launches, ensures strict operational accountability, and aligns national nuclear posture with global non-proliferation and democratic norms.

NODIA

**99.** (A) Comprehensive Integrated Border Management System
The Comprehensive Integrated Border Management System is an advanced technological solution designed to secure international borders. Integrating thermal imaging cameras, underground acoustic sensors, ground-based radars, aerostats, and automated command centers, CIBMS creates a continuous virtual fence that plugs infiltration gaps along challenging geographical terrains where physical fencing is difficult.

**100.** (C) Bangladesh (in Assam)
Project BOLD-QIT was launched by the Border Security Force under the CIBMS framework along the riverine border with Bangladesh in the Dhubri district of Assam. Deploying sensors, microwave links, and automated cameras across the Brahmaputra River, it secures areas where constructing traditional physical border fences is geographically impossible.

**101.** (A) A tethered blimp with radar and cameras to monitor ground areas
In modern border surveillance, an aerostat is a tethered, helium-filled blimp equipped with electro-optical sensors, infrared cameras, and surveillance radars. Moored to ground stations, aerostats hover continuously at elevated altitudes, providing persistent real-time intelligence, broad area observation, and early tracking of movement across difficult terrain and international boundary zones.

**102.** (D) Infrared radiation
Thermal imaging cameras used by border guarding forces operate by detecting infrared

radiation emitted by objects due to their temperature. Warm targets, such as human bodies, vehicles, or animals, emit higher levels of thermal energy than surrounding landscapes, allowing border personnel to observe infiltrators in complete darkness, heavy fog, or thick vegetation.

**103.** (B) Long-range maritime patrol and anti-submarine aircraft
The P-8I Poseidon is a specialized long-range maritime reconnaissance and anti-submarine warfare aircraft operated by the Indian Navy. Built by Boeing, it carries advanced surface search radars, magnetic anomaly detectors, acoustic sonobuoys, lightweight anti-submarine torpedoes, and anti-ship missiles to monitor ocean territories and secure critical maritime sea lines of communication.

**104.** (B) ₹35,000 crore
Under the Defence Production and Export Promotion Policy, the Indian Government set an ambitious defense export target of ₹35,000 crore (approximately 5 billion US dollars) to be achieved by the financial year 2024-25. Achieving this objective involves boosting domestic manufacturing, streamlining export licensing, and selling weapons to friendly foreign nations.

**105.** (D) Philippines
In 2022, India secured its first major international export contract for the BrahMos supersonic cruise missile system with the Philippines. The historical agreement involved supplying shore-based anti-ship missile batteries to the Philippine Marines, marking a milestone in transforming India into a prominent global defense exporter of high-technology systems.

**106.** (A) Open General Export License (OGEL) portal
The Department of Defence Production established an online portal to issue Open General Export Licenses to streamline export authorization processes. This digital mechanism permits registered defence exporters to export specified components, parts, and non-lethal equipment to designated friendly foreign nations without applying for individual licenses for every transaction, boosting exports.

**107.** (B) Wassenaar Arrangement
India joined the Wassenaar Arrangement in December 2017 as its 42nd participating state. Membership in this multilateral export control regime validated India's robust non-proliferation credentials, facilitating seamless transfer and export of advanced conventional arms, dual-use goods, and high-technology software without facing international regulatory trade barriers or sanctions regimes.

**108.** (A) I and II only
India's evolving defence export strategy includes extending Lines of Credit to friendly partner nations to facilitate their acquisition of Indian military hardware. Additionally, military attaches in overseas embassies are tasked with promoting domestic products. Exports are not restricted to NATO nations, as India actively exports equipment to Asian, African, and Latin American partner countries.

**109.** (A) Held biennially (every two years)
DefExpo is a flagship defense exhibition organized biennially (every two years) by the Department of Defence Production under the Ministry of Defence. It serves as a major international platform showcasing land, naval, air, and internal homeland security systems, encouraging collaboration, investment, and technological partnerships among global and domestic defense manufacturers.

**110.** (C) Gandhinagar
The 12th edition of DefExpo was held in October 2022 at Gandhinagar, Gujarat. Centered on the theme of national self-reliance, this specific edition was historic as it was reserved exclusively for domestic Indian defense companies, start-ups, and joint venture entities, highlighting indigenous technology innovation and defense manufacturing capabilities.

**111.** (D) Aero India
Aero India is Asia's premier international aerospace, aviation, and defense exhibition organized biennially at the Yelahanka Air Force Station in Bengaluru. Focusing on military and civil aviation, flight demonstrations, avionics, and space technology, Aero India brings together international aircraft manufacturers, defense vendors, scientific researchers, and air force delegations from across the globe.

Downloaded from www.pdf.tube

**112.** (C) Path to Pride
The overarching theme for DefExpo 2022 was Path to Pride. Held in Gandhinagar, Gujarat, this theme highlighted India's drive toward complete self-reliance in defense manufacturing, celebrating domestic technological achievements under Atmanirbhar Bharat while providing a platform for local public and private sector defence firms to showcase indigenous products.

**113.** (B) Defence exhibitions are $B_2B$ technology platforms for networking and contracts, unlike ceremonial parades.
Formal military parades are ceremonial events designed to display operational discipline, active troop units, and fielded military equipment to the general public. Conversely, defense exhibitions function primarily as business-to-business platforms where industrial vendors, defense start-ups, military delegates, and government procurers network, evaluate new technologies, negotiate transfers, and execute defense contracts.

**114.** (A) P-2, Q-3, R-4, S-1
India conducts specialized bilateral military exercises with strategic partner nations to enhance inter-operability. Surya Kiran is conducted with Nepal, while Mitra Shakti is held with Sri Lanka. Yudh Abhyas is an Army exercise conducted with the United States of America, and Exercise Garuda is a joint air combat exercise held with France.

**115.** (A) Australia
The Malabar exercise began in 1992 as a bilateral naval exercise between India and the United States. Over time, it expanded to include Japan and Australia, forming a key multilateral naval exercise involving all four Quadrilateral Security Dialogue (Quad) nations to enhance maritime domain awareness and interoperability in the Indo-Pacific region.

**116.** (C) Jodhpur Air Force Station
Exercise Desert Knight was a bilateral air exercise conducted between the Indian Air Force and the French Air and Space Force at Jodhpur Air Force Station in Rajasthan. The exercise featured operational participation of Rafale fighter aircraft from both air forces, focusing on complex air combat maneuvers, interoperability, and tactical air-to-air engagements.

**117.** (A) Oman
Exercise Al-Najah is a joint military exercise conducted between the Indian Army and the Royal Army of Oman. Frequently hosted at the Mahajan Field Firing Range in Rajasthan, the exercise focuses on counter-terrorism operations, regional security coordination, tactical desert combat drills, and enhancing mutual operational defense interoperability between the two partner nations.

NODIA

**118.** (B) Surya Kiran → Malabar Exercise → RIMPAC
Exercise structures scale in complexity and participation from bilateral to broad multilateral formats. Surya Kiran is a bilateral army exercise between India and Nepal. The Malabar Exercise is a quadrilateral naval exercise involving four nations (India, US, Japan, Australia). RIMPAC (Rim of the Pacific) represents the world's largest international multilateral maritime exercise involving dozens of nations.

**119.** (B) A system using focused energy (lasers or microwaves) to hit targets without projectiles.
A Directed-Energy Weapon is an advanced system that uses highly focused electromagnetic energy—such as high-power lasers, millimeter waves, or high-power microwaves—to disrupt, damage, or destroy enemy targets without kinetic projectiles. DEWs enable precise strikes at the speed of light with extremely low operational costs per shot fired.

**120.** (C) DURGA II
DURGA II (Directionally Unrestricted Ray-Gun Array) is a classified project managed by DRDO to develop a high-energy, lightweight directed-energy weapon system. Designed to emit intense laser beams, this system aims to disable incoming ballistic missiles, enemy aircraft, and surveillance drones, providing scalable defensive and offensive capabilities for future combat operations.

**121.** (D) A linear accelerator emitting bursts of relativistic electrons and microwaves
KALI (Kilo Ampere Linear Injector) is a linear electron accelerator developed by BARC and DRDO. Designed to emit powerful bursts of relativistic electron beams and high-power microwaves, KALI damages target electronic components, rendering incoming enemy missiles, aircraft, and satellite electronics completely

inoperable without relying on kinetic explosive strikes.

**122.** (A) The beam travels at light speed for instant hits, and shot costs are extremely low.
Laser-based Directed-Energy Weapons offer critical advantages over conventional interceptor missiles, including speed-of-light engagement that eliminates missile flight transit times. Provided adequate electrical power is maintained, laser systems feature virtually unlimited ammunition capacities and extremely low cost-per-shot metrics compared to expensive, single-use kinetic anti-aircraft and missile interceptors.

**123.** (B) I, II and III only
Directed-Energy Weapons utilize focused electromagnetic energy rather than solid kinetic projectiles. True forms of DEWs encompass High Energy Lasers, High Power Microwaves, and Particle Beam Weapons. In contrast, APFSDS rounds are conventional kinetic energy anti-tank tank shells that rely purely on physical mass and high velocity to penetrate armoured targets.

**124.** (B) Alwar-Bhiwadi
The Alwar-Bhiwadi industrial cluster in Rajasthan, located within the National Capital Region, has emerged as a major manufacturing hub for precision engineering, auto components, and defense-related hardware. Proximity to national research facilities, supply networks, and transport corridors has attracted substantial investment from private defense suppliers and component manufacturing enterprises.

**125.** (A) Defence Laboratory Jodhpur (DLJ)
Defence Laboratory Jodhpur is a DRDO facility located in Rajasthan. It has significantly contributed to defense capabilities by developing multi-spectral camouflage nets, specialized desert survival technologies, radiation detection equipment, phase change materials for extreme thermal protection, and advanced indigenous desalination and mobile water purification systems used by armed personnel.

**126.** (C) Bikaner
The Mahajan Field Firing Range is the Indian Army's largest land-based field firing range, situated in the Bikaner district of Rajasthan. Offering expansive desert terrain, it is heavily utilized for testing heavy artillery guns, armour maneuvers, and missile systems, while routinely hosting joint military exercises with foreign allied armed forces.

**127.** (D) Jaisalmer
The Pokhran Test Range is located in the Jaisalmer district of Rajasthan. Chosen for its remote geography, low population density, and suitable arid terrain, Pokhran served as the historical site for both of India's major nuclear tests: Operation Smiling Buddha in 1974 and Operation Shakti in 1998.

**128.** (C) Precision engineering and metalworks
Rajasthan's micro, small, and medium enterprises possess a robust industrial footprint in precision engineering, metallurgy, casting, and metalworks. This industrial base provides critical supply chain support for national defense manufacturing, enabling local vendors to produce precision components, structural parts, and specialized sub-assemblies for defense public sector undertakings and private contractors.

**129.** (A) I, III, II
Geographically from North to South across Rajasthan, Suratgarh Military Station is situated furthest north in Sri Ganganagar district near the border. Moving southward, Bikaner Military Station occupies a central-northern position, while Jodhpur Military Station lies further south in the Thar region, reflecting strategic military base distribution along the western frontier.

**130.** (D) 75%
To accelerate defense self-reliance under Atmanirbhar Bharat, the Ministry of Defence earmarked 75% of its total capital procurement budget for domestic industry purchasing during FY 2023-24. This policy mandates that three-fourths of capital modernization funds are spent directly on indigenous equipment, fostering growth across domestic defense manufacturers.

**131.** (A) It reduces pension costs, freeing funds for capital modernization.
The Agnipath scheme restructures military recruitment by enrolling soldiers, known as Agniveers, for four-year service tenures. A key long-term financial objective of this reform is reducing the ballooning military pension bill, thereby freeing substantial revenue funds within the defense budget for capital outlay, research, and high-tech equipment procurement.

Click Here to Buy book on Amazon

**132.** (C) Procurement of new fighter jets and naval base construction
Capital Outlay in the Defence Budget refers to expenditure spent on acquiring fixed assets, long-term infrastructure, and major hardware modernization. Procurement of fighter aircraft, warships, tanks, artillery systems, and military base construction falls under Capital Outlay. Revenue Expenditure covers recurring costs like salaries, fuel, operational maintenance, and military pensions.

**133.** (A) To unify the three services under single geographical commands for joint operations.
Integrated Theatre Commands represent a major structural reform aimed at replacing separate service commands with unified geographical commands. Under this model, operational units from the Army, Navy, and Air Force within a designated theater report to a single Commander, ensuring seamless joint warfighting capabilities, optimized resource allocation, and cohesive operational execution.

**134.** (D) Non-Lapsable Defence Modernisation Fund
To address capital budget lapses at the end of financial years, the government agreed to establish a Non-Lapsable Defence Modernisation Fund. This dedicated financial vehicle allows unspent capital acquisition funds to roll over into subsequent fiscal years, ensuring sustained long-term financing for major defense acquisitions, military R&D, and equipment modernization.

**135.** (B) Successful test of an Anti-Satellite missile intercepting a low Earth orbit target.
Mission Shakti, conducted in March 2019, was India's first successful Anti-Satellite missile test. Executed by DRDO, a ballistic missile interceptor struck a live, decommissioned Indian satellite in Low Earth Orbit with kinetic precision. This achievement established India as the fourth nation possessing proven space defense and strategic ASAT warfare capabilities.

**136.** (C) Defence Space Agency (DSA)
The Defence Space Agency is a specialized tri-service organization established under the Ministry of Defence to integrate space assets of the Indian Armed Forces. Staffed by Army, Navy, and Air Force personnel, DSA manages space-based surveillance, satellite communications, navigation systems, and coordinates space-domain defense strategies against orbital threats.

**137.** (D) Using lasers to blind satellite sensors or jamming communication signals.
Non-kinetic space warfare involves neutralizing target space assets without physical destruction or collision debris. Methods include using ground or space-based lasers to blind optical sensors, high-power radio frequency jamming to disrupt satellite communications, and cyber operations to compromise orbital control systems, preserving space environment safety while degrading adversary capabilities.

**138.** (A) It bans nuclear weapons and weapons of mass destruction in Earth orbit.
The Outer Space Treaty of 1967, ratified by major spacefaring nations including India, establishes international space law frameworks. It explicitly prohibits placing nuclear weapons or weapons of mass destruction in Earth orbit, installing them on celestial bodies, or stationing them in outer space, ensuring space remains reserved for peaceful international exploration.

**139.** (B) Hostile actions (cyber-attacks, disinformation, proxies) below conventional war thresholds.
Grey-zone warfare refers to competitive interactions among state actors that fall between traditional peace and formal open military conflict. It employs covert tools such as cyber operations, economic coercion, disinformation campaigns, maritime harassment, and proxy forces to achieve strategic advantages without crossing thresholds that would trigger open, large-scale conventional military response actions.

**140.** (B) Cyberspace
Modern military doctrines recognize Cyberspace as the fifth official domain of warfare, joining land, sea, air, and space. Cyberspace encompasses interconnected computer networks, digital infrastructures, and electronic data systems, serving as a critical battlefield where offensive and defensive cyber operations impact military command, critical infrastructure, and national security.

NODIA
www.nodia.in

# CHAPTER 03
# Space Technology and Satellites

**1.** The Indian Space Research Organisation (ISRO) was formally established in which of the following years?
(A) 1962
(B) 1965
(C) 1969
(D) 1972

**2.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** ISRO was established to supersede the Indian National Committee for Space Research (INCOSPAR).
**Reason (R):** INCOSPAR was dissolved by international space regulatory bodies due to a lack of funding.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**3.** Under which department of the Government of India does the Indian Space Research Organisation (ISRO) currently operate?
(A) Department of Science and Technology
(B) Department of Space
(C) Ministry of Defence
(D) Ministry of Earth Sciences

**4.** Who among the following is widely regarded as the founding father of the Indian space programme?
(A) Homi J. Bhabha
(B) A. P. J. Abdul Kalam
(C) Satish Dhawan
(D) Vikram Sarabhai

**5.** Consider the following statements regarding the early history of the Indian space programme:
I. The first sounding rocket was launched from Thumba Equatorial Rocket Launching Station.
II. INCOSPAR was set up by the Government of India in 1962.
III. Aryabhata, India's first satellite, was launched using an indigenous Indian launch vehicle.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**6.** The headquarters of the Indian Space Research Organisation (ISRO) is located in which city?
(A) Bengaluru
(B) Hyderabad
(C) Thiruvananthapuram
(D) Sriharikota

**7.** Match List I with List II:
**List I: (Space Centre)**
P. Vikram Sarabhai Space Centre (VSSC)
Q. U R Rao Satellite Centre (URSC/ISAC)
R. Space Applications Centre (SAC)
S. Satish Dhawan Space Centre (SDSC)
**List II: (Location)**
1. Sriharikota
2. Ahmedabad
3. Thiruvananthapuram
4. Bengaluru
Select the correct answer using the options given below:
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-1, S-2
(C) P-3, Q-4, R-2, S-1
(D) P-2, Q-1, R-4, S-3

**8.** The Vikram Sarabhai Space Centre (VSSC) is primarily responsible for which of the following activities?
(A) Design and development of launch vehicles
(B) Development and fabrication of satellite payloads
(C) Tracking and commanding of geostationary satellites
(D) Processing and archiving of meteorological data

Downloaded from www.pdf.tube

**9.** Which space centre is considered the lead centre for the design, development, and integration of Indian satellites?
(A) Master Control Facility (MCF)
(B) Liquid Propulsion Systems Centre (LPSC)
(C) National Remote Sensing Centre (NRSC)
(D) U R Rao Satellite Centre (URSC)

**10.** Sriharikota was chosen as India's primary spaceport mainly because of which geographical advantage?
(A) Its elevated high-altitude terrain far above sea level
(B) Its proximity to the equator and east coast location
(C) Its extremely dense forest cover ensuring national security
(D) Its geographical location near the magnetic North Pole

**11.** Find the odd one out among the following ISRO facilities based on their primary operational domain.
(A) Vikram Sarabhai Space Centre (VSSC)
(B) Satish Dhawan Space Centre (SDSC)
(C) Indian Institute of Remote Sensing (IIRS)
(D) Liquid Propulsion Systems Centre (LPSC)

**12.** Which of the following represents the correct chronological sequence of the operational development of Indian satellite launch vehicles?
(A) SLV-3, ASLV, PSLV, GSLV
(B) ASLV, SLV-3, GSLV, PSLV
(C) SLV-3, PSLV, ASLV, GSLV
(D) PSLV, SLV-3, ASLV, GSLV

**13.** The SLV-3 successfully placed which satellite into orbit in 1980, making India the sixth member of the exclusive space-faring club?
(A) Aryabhata
(B) Bhaskara-I
(C) APPLE
(D) Rohini (RS-1)

**14.** What does the acronym $LVM_3$, ISRO's heaviest operational launch vehicle, stand for?
(A) Launch Vehicle Mark-3
(B) Lunar Vehicle Mark 3
(C) Liquid Vehicle Mission 3
(D) Low-orbit Vehicle Mark 3

**15.** Consider the following statements regarding ISRO's launch vehicles:
I. PSLV is designed mainly to deliver earth observation satellites to polar sun-synchronous orbits.
II. GSLV is primarily designed to launch heavy communication satellites into geosynchronous transfer orbits.
III. $LVM_3$ can lift up to 4,000 kg into a Geosynchronous Transfer Orbit (GTO).
IV. SSLV is designed purely as a heavy-lift reusable launch vehicle.
Which of the above statements is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I, III and IV only

NODIA

**16.** The Small Satellite Launch Vehicle (SSLV) was developed by ISRO primarily to cater to which market?
(A) Deep space and interplanetary exploration missions
(B) Launch-on-demand services for small satellites
(C) Heavy communication satellites into geostationary orbit
(D) Crewed human spaceflight and orbital station missions

**17.** The Polar Satellite Launch Vehicle (PSLV) is highly regarded globally for its reliability. How many stages does the standard PSLV possess?
(A) Two stages
(B) Three stages
(C) Four stages
(D) Five stages

**18.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** The payload capacity of GSLV is significantly higher than that of PSLV for higher orbits.
**Reason (R):** GSLV utilizes a highly efficient cryogenic upper stage, which PSLV does not possess.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**19.** The stages of the Polar Satellite Launch Vehicle (PSLV) alternate between which types of propulsion?
(A) Solid and Cryogenic
(B) Liquid and Cryogenic

(C) Solid and Liquid
(D) Semi-cryogenic and Solid

**20.** Which of the following describes the correct stage configuration of the standard GSLV Mk II launch vehicle?
(A) First stage solid, second stage liquid, third stage cryogenic
(B) First stage liquid, second stage solid, third stage cryogenic
(C) First stage solid, second stage cryogenic, third stage liquid
(D) First stage cryogenic, second stage liquid, third stage solid

**21.** If ISRO needs to launch a 1.5-ton remote sensing satellite into a 600 km polar sun-synchronous orbit, which launch vehicle is most optimal and traditionally used?
(A) SSLV
(B) GSLV Mk II
(C) PSLV
(D) $LVM_3$

**22.** What is the primary technical difference that gives cryogenic engines an advantage over solid rocket motors in the upper stages of GSLV?
(A) Cryogenic engines can operate efficiently without any oxygen supply.
(B) Cryogenic engines provide much higher specific impulse.
(C) Cryogenic propellants can be easily stored at ambient room temperature.
(D) Cryogenic engines rely exclusively on solar energy to heat propellants.

**23.** Which of the following strap-on motor configurations is used in the PSLV-XL variant to provide additional thrust?
(A) Two solid strap-on motors
(B) Four liquid strap-on motors
(C) Six solid strap-on motors
(D) Eight semi-cryogenic strap-on motors

**24.** What is the primary function of a remote sensing satellite?
(A) To observe and map Earth's physical features
(B) To broadcast direct-to-home television and radio signals
(C) To provide precise global positioning and navigation coordinates
(D) To serve as a habitable space station for orbital astronauts

**25.** Consider the following statements regarding types of satellites:
I. Weather satellites are generally placed in Geostationary or Polar orbits to monitor cloud cover and storms.
II. Navigation satellites require highly accurate atomic clocks to determine precise positioning.
III. High-throughput communication satellites typically use Low Earth Orbit exclusively for direct-to-home television broadcast.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**26.** Which of the following is NOT a typical application of an Earth Observation (remote sensing) satellite?
(A) Direct-to-Home (DTH) broadcasting
(B) Regional groundwater prospect mapping and management
(C) Real-time forest fire detection and monitoring
(D) Seasonal crop acreage and yield estimation

**27.** Which type of orbit is most commonly utilized for major communication satellites to ensure continuous coverage over a specific region?
(A) Sun-synchronous orbit
(B) Highly elliptical orbit
(C) Low Earth polar orbit
(D) Geostationary orbit

**28.** Which of the following satellite series is ISRO's dedicated space observatory for multi-wavelength astronomy?
(A) INSAT
(B) Astrosat
(C) Cartosat
(D) GSAT

**29.** The INSAT (Indian National Satellite) system is primarily established to serve which sectors?
(A) Interplanetary exploration and deep space communications
(B) Military reconnaissance and border surveillance operations
(C) Telecommunications, broadcasting, and meteorology
(D) Precise navigational positioning and timing services

Click Here to Buy book on Flipkart

**30.** Which satellite in the GSAT series was uniquely known as 'EDUSAT', India's first thematic satellite dedicated exclusively for educational services?
(A) GSAT-1
(B) GSAT-3
(C) GSAT-6
(D) GSAT-11

**31.** Match List I with List II:
**List I: (Satellite)**
P. GSAT-30
Q. Kalpana-1 (METSAT)
R. Cartosat-3
S. RISAT
**List II: (Primary Characteristic/Application)**
1. Dedicated meteorological satellite
2. Synthetic Aperture Radar imaging
3. High-resolution optical remote sensing
4. Communication and DTH services
Select the correct answer using the options given below:
(A) P-4, Q-1, R-3, S-2
(B) P-1, Q-4, R-2, S-3
(C) P-4, Q-3, R-1, S-2
(D) P-3, Q-1, R-4, S-2

**32.** High Throughput Satellites (HTS) in the GSAT series, such as GSAT-11 and GSAT-29, are primarily intended to provide which service?
(A) High-resolution topographic mapping for urban development
(B) High-speed internet connectivity for remote areas
(C) Early warning alerts for tsunamis and coastal disasters
(D) Precision location and timing services for smartphones

**33.** The GSAT-24 satellite, launched by Arianespace for NewSpace India Limited (NSIL), had its entire capacity leased to which direct-to-home service provider?
(A) Airtel Digital TV
(B) Tata Play
(C) Dish TV
(D) Sun Direct

**34.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** Some satellites in the INSAT series carry instruments like Very High Resolution Radiometers (VHRR).
**Reason (R):** The INSAT series is designed not only for communication but also to support meteorological forecasting and disaster warning.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**35.** What is the primary objective of the Cartosat series of satellites developed by ISRO?
(A) Deep space and interplanetary communication services
(B) Providing satellite atomic clock timing signals
(C) High-resolution Earth observation
(D) Global ocean state forecasting and modeling

**36.** Which was the first operational remote sensing satellite launched by India under the IRS programme?
(A) IRS-1A
(B) IRS-1B
(C) IRS-P4
(D) Cartosat-1

**37.** What unique capability does the RISAT (Radar Imaging Satellite) series possess compared to earlier IRS optical satellites?
(A) Direct broadcasting of television channels in ultra-high definition
(B) Polar orbiting around the Moon to map deep lunar impact craters
(C) All-weather, day-and-night surface imaging capability
(D) Continuous measurement of changes in Earth's gravitational field

**38.** Consider the following statements about the Cartosat series:
I. They are part of India's Earth Observation satellite fleet.
II. They are primarily placed in geostationary orbits.
III. They provide high-resolution panchromatic imagery.
IV. Cartosat-3 offers an exceptionally high spatial resolution of around 0.25 meters.
Which of the above statements is/are correct?
(A) I, III and IV only
(B) I, II and III only
(C) II, III and IV only
(D) I, II, III and IV

Downloaded from www.pdf.tube

**39.** The Oceansat series of satellites is specifically optimized for which of the following applications?
(A) Continuous monitoring of sub-surface tectonic plate movements
(B) Relaying high-speed broadband internet to maritime vessels
(C) Detecting deep underground mineral and resource deposits
(D) Studying ocean colour and sea surface winds

**40.** What is the operational name given by the Government of India to the Indian Regional Navigation Satellite System (IRNSS)?
(A) NavIC
(B) GAGAN
(C) Bhuvan
(D) Vayu

**41.** How many satellites currently constitute the space segment of the standard IRNSS (NavIC) constellation required for full operational capability?
(A) 4 satellites
(B) 7 satellites
(C) 12 satellites
(D) 24 satellites

**42.** Which specific orbital configuration is used by the 7 satellites of the NavIC constellation?
(A) 3 in Geostationary orbit and 4 in Geosynchronous orbit
(B) 4 in Geostationary orbit and 3 in Geosynchronous orbit
(C) 7 satellites positioned uniformly in Low Earth orbit
(D) 3 in Sun-synchronous Polar orbit and 4 in Geostationary orbit

**43.** Arrange the following global or regional navigation satellite systems in alphabetical order of the countries/unions that operate them (China, Europe, India, USA):
I. NavIC
II. GPS
III. Galileo
IV. BeiDou
(A) IV, III, I, II
(B) I, II, III, IV
(C) IV, I, III, II
(D) III, IV, II, I

**44.** NavIC (IRNSS) transmits its navigation service signals in which two frequency bands?
(A) Ku and Ka bands
(B) $L_5$ and S bands
(C) C and X bands
(D) $L_1$ and $L_2$ bands

**45.** What is the intended primary coverage area of the NavIC navigation system?
(A) Continuous navigation coverage across the entire globe
(B) Maritime boundaries and economic zones of the Indian Ocean
(C) Indian landmass and 1,500 km beyond its borders
(D) Entire Asian continent along with the Australian region

**46.** Which landmark discovery is most prominently associated with India's Chandrayaan-1 mission?
(A) Discovery and mapping of previously unknown lunar craters
(B) Discovery of recently active volcanic activity on the Moon
(C) Successful first soft landing near the lunar South Pole
(D) Detection of water molecules on the lunar surface

**47.** The lander and rover of the Chandrayaan-2 mission were respectively named:
(A) Vikram and Pragyan
(B) Pragyan and Vikram
(C) Aditya and Vyom
(D) Vikram and Bhaskara

**48.** Consider the following statements about Chandrayaan-3:
I. It successfully executed a soft landing near the lunar south pole.
II. The point where the lander touched down was named 'Shiv Shakti Point'.
III. The launch was carried out using the PSLV-C55 rocket.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**49.** Which heavy-lift launch vehicle was utilized to launch the Chandrayaan-3 mission?
(A) PSLV-XL
(B) $LVM_3$ (GSLV Mk III)
(C) GSLV Mk II
(D) SSLV

NODIA

**50.** In the Chandrayaan-3 mission, what was the primary source of power for the Pragyan rover?
(A) Solar panels
(B) Radioisotope thermoelectric generator (RTG)
(C) Lithium-ion battery charged prior to launch
(D) Hydrogen fuel cells

**51.** What was the fate of the Chandrayaan-1 mission when it officially ended in 2009?
(A) It soft-landed on the moon and completed all scheduled experiments
(B) It successfully maneuvered back into Earth's orbital path
(C) Communication with the spacecraft was lost
(D) It was intentionally crashed into the lunar north pole region

**52.** The Mars Orbiter Mission (MOM), also known as Mangalyaan, was launched by ISRO in which year?
(A) 2008
(B) 2011
(C) 2013
(D) 2016

**53.** Which launch vehicle was used to successfully launch the Mars Orbiter Mission (Mangalyaan)?
(A) GSLV Mk III
(B) GSLV Mk II
(C) PSLV-$C_{25}$
(D) $LVM_3$-M1

**54.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** Mangalyaan was placed into a highly elliptical orbit around Mars rather than a circular low orbit.
**Reason (R):** An elliptical orbit required significantly less fuel for the Mars orbit insertion maneuver, minimizing the payload weight requirement.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**55.** What specific global record was set by ISRO through its Mars Orbiter Mission?
(A) First nation to successfully land a robotic rover on Mars
(B) First nation to retrieve and return soil samples from Mars
(C) First nation to discover liquid water on the Martian surface
(D) First nation to reach Martian orbit on maiden attempt

**56.** Which of the following payloads on Mangalyaan was designed specifically to map the presence of a potential biosignature gas in the Martian atmosphere?
(A) Methane Sensor for Mars (MSM)
(B) Mars Color Camera (MCC)
(C) Thermal Infrared Imaging Spectrometer (TIS)
(D) Mars Exospheric Neutral Composition Analyser (MENCA)

**57.** The Mars Orbiter Mission finally lost communication and formally concluded in 2022 primarily due to which event?
(A) A collision with a Martian asteroid
(B) Malfunction in its solar panels caused by a dust storm
(C) A long eclipse that exhausted its battery capacity
(D) Exhaustion of its communication antenna capability

**58.** What is the fundamental objective of ISRO's Gaganyaan programme?
(A) To demonstrate human spaceflight capability to Low Earth Orbit
(B) To send a robotic rover to Venus
(C) To establish an autonomous space station in geostationary orbit
(D) To land an Indian astronaut on the Moon

**59.** The Gaganyaan mission aims to send a crew of how many members, and for a mission of what planned duration?
(A) 2 members for 7 days
(B) 3 members for 3 days
(C) 4 members for 5 days
(D) 3 members for 14 days

**60.** Consider the following statements about the Gaganyaan mission:
I. The crew module is designed to safely re-enter the Earth's atmosphere and splash down in Indian waters.
II. The mission will utilize a human-rated version of the PSLV rocket.
III. Vyommitra is a humanoid robot developed to test the crew module's life support

Click Here to Buy book on Amazon

systems before human flight.
IV. The orbital module will be positioned at an altitude of approximately 400 km.
Which of the above statements is/are incorrect?
(A) I and III only
(B) II only
(C) II and IV only
(D) III and IV only

**61.** Who or what is 'Vyommitra' in the context of the Gaganyaan mission?
(A) A newly developed advanced spacesuit for astronaut protection
(B) The specialized launch pad infrastructure built for crewed spaceflight
(C) A half-humanoid robot for uncrewed test missions
(D) The primary recovery ship designated by the Indian Navy

**62.** Which critical safety mechanism is uniquely integrated into the $HLVM_3$ (Human-Rated $LVM_3$) rocket for the Gaganyaan mission to protect astronauts in case of a launch anomaly?
(A) Cryogenic Backup Thruster
(B) Parachute deployment before liftoff
(C) Autopilot Emergency Landing System
(D) Crew Escape System (CES)

**63.** What is the primary scientific objective of the Aditya-$L_1$ mission?
(A) To study the solar atmosphere and corona
(B) To analyze the composition of the tenuous lunar exosphere
(C) To map the internal magnetic field structure of Jupiter
(D) To discover and analyze exoplanets outside our solar system

**64.** In the Aditya-$L_1$ mission, what does '$L_1$' represent?
(A) Lunar orbit 1
(B) Lagrange Point 1
(C) Launch Pad 1
(D) Light-year 1

**65.** Approximately how far is the $L_1$ point from the Earth, where the Aditya-$L_1$ spacecraft is positioned?
(A) 1.5 million kilometers
(B) 3.84 million kilometers
(C) 150 million kilometers
(D) 36,000 kilometers

**66.** Match List I with List II:

**List I: (Aditya-$L_1$ Payload)**
P. Visible Emission Line Coronagraph (VELC)
Q. Solar Ultraviolet Imaging Telescope (SUIT)
R. Aditya Solar wind Particle Experiment (ASPEX)
S. Plasma Analyser Package for Aditya (PAPA)
**List II: (Primary Function)**
1. Imaging the solar photosphere and chromosphere in UV
2. Studying the solar corona and coronal mass ejections
3. Understanding solar wind properties and plasma
4. Studying solar wind ions and energy distribution
Select the correct answer using the options given below:
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-1, R-3, S-4
(D) P-3, Q-4, R-1, S-2

NODIA

**67.** Which is the primary and largest payload on board the Aditya-$L_1$ spacecraft?
(A) SUIT
(B) PAPA
(C) VELC
(D) SoLEXS

**68.** Which launch vehicle was used by ISRO to launch the Aditya-$L_1$ spacecraft?
(A) $LVM_3$
(B) $GSLV\text{-}F_{12}$
(C) $SSLV\text{-}D_2$
(D) $PSLV\text{-}C_{57}$

**69.** Which term describes a theoretical scenario where the density of space debris in low Earth orbit becomes so high that collisions generate more debris, leading to a runaway chain reaction?
(A) Carrington Event
(B) Roche Limit
(C) Kessler Syndrome
(D) Fermi Paradox

**70.** What is the name of the early warning system established by ISRO to track, detect, and protect its space assets from space debris?
(A) Project TRISHNA
(B) Project NETRA
(C) Project GAGAN
(D) Project SHIELD

**71.** What is a 'graveyard orbit' in the context of space debris management?
(A) A low Earth orbit where decommissioned satellites intentionally burn up quickly in the atmosphere
(B) The specific orbital path occupied by the Moon where inactive dead satellites are made to crash
(C) An elliptical orbit beyond Mars used exclusively for disposing of retired interplanetary space probes
(D) A super-synchronous orbit above GEO for retired satellites

**72.** Which two primary technologies are used by ground stations to track space debris in Earth's orbit?
(A) Radar and Optical telescopes
(B) Sonar and Lidar
(C) Seismometers and Magnetometers
(D) Infrared scanners and X-ray detectors

**73.** Consider the following statements regarding space debris mitigation:
I. Satellites in Low Earth Orbit (LEO) are encouraged to de-orbit within 25 years of their end-of-life.
II. Satellites in Geostationary Orbit (GEO) are typically de-orbited directly into the Earth's oceans.
III. Project NETRA involves sending active ISRO satellites equipped with lasers to destroy debris in space.
Which of the above statements is/are incorrect?
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

**74.** What is the primary role of the Inter-Agency Space Debris Coordination Committee (IADC)?
(A) To share debris research and suggest mitigation guidelines
(B) To actively capture and physically remove orbital debris using international robotic arms
(C) To legally prosecute private commercial companies that generate hazardous space debris
(D) To deploy massive orbital radiation shields protecting the International Space Station

**75.** NewSpace India Limited (NSIL) was incorporated in 2019 as a wholly owned Government of India company under which entity?
(A) Department of Science and Technology
(B) Ministry of Commerce and Industry
(C) NITI Aayog
(D) Department of Space

**76.** What is the primary mandate of NewSpace India Limited (NSIL)?
(A) To act as the official regulatory body for national space traffic management
(B) To commercially exploit ISRO's R&D outputs
(C) To scientifically explore and map the deep solar system environments
(D) To provide satellite meteorological data exclusively to defense forces

**77.** What does the acronym IN-SPACe stand for in the context of the Indian space sector?
(A) Indian Network for Space Propulsion and Advanced Computation
(B) International Nodal Space Project and Aviation Centre
(C) Indian National Space Promotion and Authorization Centre
(D) Indian Nanosatellite Space Production and Aerodynamics Company

**78.** Which of the following rockets, launched in November 2022, became India's first privately developed launch vehicle?
(A) Agnibaan
(B) Kalam-1
(C) Chetak-V
(D) Vikram-S

**79.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** IN-SPACe acts as an independent single-window nodal agency for the private space sector.
**Reason (R):** IN-SPACe allows non-governmental entities to use ISRO's infrastructure and facilities to promote private participation.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

Downloaded from www.pdf.tube

**80.** The 3D-printed semi-cryogenic rocket engine 'Agnilet' was successfully developed and tested by which Indian private space startup?
(A) Skyroot Aerospace
(B) Agnikul Cosmos
(C) Bellatrix Aerospace
(D) Pixxel

**81.** NISAR is an upcoming major Earth observation mission. It is a joint collaboration between ISRO and which international space agency?
(A) ESA (European Space Agency)
(B) NASA (National Aeronautics and Space Administration)
(C) JAXA (Japan Aerospace Exploration Agency)
(D) Roscosmos (Russian Space Agency)

**82.** The TRISHNA mission, designed for high-resolution thermal infrared imaging of the Earth's surface, is a collaborative effort between ISRO and the space agency of which country?
(A) France (CNES)
(B) State of Israel
(C) Germany (DLR Aerospace)
(D) Japan (JAXA Agency)

**83.** Which of the following represents the correct sequence of India's international space engagements based on the date they were initiated or signed, from earliest to latest?
(A) Signing the Outer Space Treaty, Launching the first foreign satellite on PSLV, Signing the Artemis Accords
(B) Launching the first foreign satellite on PSLV, Signing the Outer Space Treaty, Signing the Artemis Accords
(C) Signing the Artemis Accords, Signing the Outer Space Treaty, Launching the first foreign satellite on PSLV
(D) Signing the Outer Space Treaty, Signing the Artemis Accords, Launching the first foreign satellite on PSLV

**84.** LUPEX (Lunar Polar Exploration Mission) is a proposed joint robotic mission to the Moon by ISRO and which other agency?
(A) NASA
(B) ESA
(C) Roscosmos
(D) JAXA

**85.** India became a signatory to the Artemis Accords in 2023. What is the primary purpose of these accords?
(A) To facilitate sharing of proprietary military satellite surveillance data among allied nations
(B) To legally ban the orbital deployment of conventional weapons in Low Earth Orbit
(C) Framework for peaceful lunar and space exploration
(D) To restrict private commercial companies from mining and extracting lunar asteroids

**86.** A satellite in a Geostationary Earth Orbit (GEO) is positioned at approximately what altitude above the Earth's equator?
(A) 400 km altitude
(B) 2,000 km altitude
(C) 20,200 km altitude
(D) 35,786 km

**87.** What is the defining characteristic of a Sun-synchronous orbit?
(A) The satellite remains permanently fixed over one point on the Earth's equator.
(B) The satellite always faces the sun and never enters the Earth's shadow.
(C) The orbit is highly elliptical and takes the satellite exactly one year to complete.
(D) The satellite crosses the equator at the same local solar time during every pass.

NODIA

**88.** Consider the following statements regarding orbits:
I. Low Earth Orbit (LEO) is typically found at altitudes up to 2,000 km.
II. Medium Earth Orbit (MEO) is commonly used for navigation satellite constellations like GPS.
III. Geostationary Orbit (GEO) has an orbital period matching the Earth's rotational period.
IV. Sun-synchronous orbits are generally a type of polar orbit.
Which of the above statements is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**89.** An orbit is considered a 'Polar Orbit' if its inclination to the Earth's equator is approximately:
(A) 0 degrees

(B) 45 degrees
(C) 90 degrees
(D) 180 degrees

**90.** How long does it take for a satellite in Geostationary orbit to complete one revolution around the Earth?
(A) 90 minutes
(B) 12 hours
(C) 24 hours
(D) 365 days

**91.** What is the primary difference between a Geostationary Orbit (GEO) and a Geosynchronous Orbit (GSO)?
(A) GEO is strictly circular in shape, whereas GSO must always be highly elliptical in orbit
(B) GEO completes an orbit in 24 hours, whereas GSO completes an orbit in 12 hours
(C) GEO is used exclusively for Earth observation, while GSO is reserved for communication
(D) GEO has zero inclination (equatorial), while GSO can have inclination

**92.** In satellite communication technology, what is the fundamental role of a transponder?
(A) To continuously provide electrical power to satellite instruments using solar panels
(B) To receive, amplify, frequency-shift, and retransmit signals
(C) To physically adjust and re-orient the satellite body to maintain Earth pointing
(D) To capture and process high-resolution optical images of the Earth's surface

**93.** Match List I with List II:
**List I: (Frequency Band)**
P. L-band
Q. C-band
R. Ku-band
S. Ka-band
**List II: (Typical Frequency Range in Satellite Comm)**
1. 1 to 2 GHz
2. 4 to 8 GHz
3. 12 to 18 GHz
4. 26 to 40 GHz
Select the correct answer using the options given below:
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-3, R-2, S-4
(C) P-1, Q-2, R-3, S-4
(D) P-4, Q-3, R-2, S-1

**94.** The Direct-To-Home (DTH) television broadcasting services in India primarily utilize which frequency band?
(A) L-band
(B) S-band
(C) UHF-band
(D) Ku-band

**95.** 'Rain fade' is a phenomenon where heavy rainfall absorbs and attenuates satellite signals. Which frequency bands are most severely affected by this issue?
(A) Ku and Ka bands
(B) L and S bands
(C) C and X bands
(D) VHF and UHF bands

**96.** Despite requiring larger antenna sizes, the C-band remains crucial for satellite communication primarily because:
(A) It provides the fastest data transmission rates and widest bandwidth available
(B) High resilience to weather attenuation like rain
(C) It eliminates the operational requirement of onboard satellite transponders
(D) It is strictly restricted to military communications for enhanced security

**97.** The capacity of a communication satellite is generally expressed in terms of the number of its transponders. A standard transponder traditionally corresponds to a bandwidth of roughly:
(A) 1 MHz
(B) 36 MHz
(C) 1 GHz
(D) 100 GHz

**98.** Which web portal developed by ISRO provides a platform to explore 2D and 3D satellite imagery of India and plays a vital role in disaster management mapping?
(A) Bhuvan
(B) VEDAS
(C) MOSDAC
(D) GAGAN

**99.** Synthetic Aperture Radar (SAR) sensors on satellites like RISAT are highly valuable for flood monitoring primarily because:
(A) They can accurately measure the chemical and biological composition of floodwaters
(B) They can physically redirect incoming

Click Here to Buy book on Flipkart

floodwaters using high-intensity microwaves
(C) Penetrates clouds and operates day/night for imaging
(D) They automatically detect and transmit emergency distress signals from smartphones

**100.** Consider the following statements about satellite use in disaster management:
I. Satellites equipped with Synthetic Aperture Radar (SAR) can map flooded areas during heavy monsoons.
II. Thermal infrared sensors on satellites are utilized to monitor active forest fires.
III. Geostationary satellites provide continuous tracking of cloud patterns for cyclone forecasting.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**101.** The 'International Charter Space and Major Disasters', of which ISRO is a member, was created to:
(A) Establish a global insurance fund to compensate victims of hazardous space debris impacts
(B) Build international space stations dedicated exclusively to monitoring global weather phenomena
(C) Provide space data delivery to disaster-affected nations
(D) Regulate and mandate international authorization for military satellite launches over disaster zones

**102.** Which specific type of satellite sensor is most suitable for detecting and monitoring the progress of large-scale forest fires?
(A) High-resolution optical sensors in the visible spectrum
(B) Thermal infrared sensors
(C) X-ray spectrometers
(D) Altimeters

**103.** What is the primary objective of the FASAL (Forecasting Agricultural output using Space, Agrometeorology and Land based observations) project?
(A) To genetically design climate-resilient crop seeds utilizing space-based biological experiments
(B) To distribute subsidized high-precision GPS navigation receivers directly to domestic farmers
(C) To physically irrigate farmlands through autonomous drone and robotic agricultural technologies
(D) Provide pre-harvest crop production forecasts nationally

**104.** In satellite agriculture monitoring, the acronym NDVI stands for:
(A) Normalized Difference Vegetation Index
(B) National Drought Monitoring and Vegetation Index
(C) Natural Disaster Assessment and Valuation Index
(D) Near-infrared Satellite Data Visualization Index

NODIA

**105.** Meteorological payloads like the Imager and Sounder are typically found on which class of ISRO satellites?
(A) NavIC navigation satellite constellation
(B) Cartosat earth observation satellites
(C) INSAT/GSAT satellites
(D) Astrosat space observatory

**106.** Arrange the typical steps involved in utilizing satellite imagery for agricultural crop yield forecasting in the correct logical sequence:
I. Extraction of vegetative indices (e.g., NDVI)
II. Acquisition of raw satellite image and atmospheric correction
III. Final yield estimation using empirical models
IV. Crop classification and spatial masking of the study area
(A) II, I, IV, III
(B) I, II, IV, III
(C) II, IV, I, III
(D) II, I, III, IV

**107.** The CHAMAN project, supported by ISRO's space technology, is specifically targeted towards the assessment and development of which agricultural sector?
(A) Marine fisheries
(B) Poultry farming
(C) Cash crops like cotton and jute
(D) Horticulture crops

**108.** Which physical parameter is measured by specific microwave satellite sensors to directly assist in scheduling agricultural irrigation?
(A) Atmospheric carbon dioxide

(B) Soil moisture
(C) Solar ultraviolet intensity
(D) Wind speed at altitude

**109.** Where is the headquarters of the State Remote Sensing Application Centre (SRSAC) of Rajasthan located?
(A) Jaipur
(B) Udaipur
(C) Jodhpur
(D) Bikaner

**110.** The State Remote Sensing Application Centre (SRSAC) in Rajasthan operates under the administrative control of which state department?
(A) Department of Agriculture and Farmers Welfare
(B) Department of Revenue and Land Records
(C) Department of Mines, Minerals and Geology
(D) Department of Science & Technology

**111.** Consider the following statements regarding Rajasthan's utilization of space technology:
I. The State Remote Sensing Application Centre (SRSAC) provides geospatial support for the state's planning departments.
II. Rajasthan extensively uses satellite data for monitoring desertification and sand dune stabilization.
III. Satellite imagery is strictly prohibited from being used for groundwater prospect mapping in the state.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**112.** Consider the following statements regarding active applications of remote sensing technology by the Rajasthan government:
I. Mapping of wastelands and monitoring desertification.
II. Monitoring of illegal mining activities in the Aravalli ranges.
III. Forecasting of monsoonal winds originating in the deep Indian Ocean.
IV. Crop acreage estimation and drought assessment.
Which of the above statements is/are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

**113.** The Rajiv Gandhi Centre of Advanced Technology (R-CAT) in Rajasthan facilitates training and collaborations in advanced tech fields. In the context of space tech, such institutions help state governance primarily by:
(A) Building and assembling indigenous space launch vehicles within state facilities in Rajasthan
(B) Developing GIS and satellite data skills for governance
(C) Training selected military pilots and astronauts for upcoming crewed Gaganyaan missions
(D) Establishing commercial spaceports and rocket launch pads within the Thar desert region

**114.** The foundational treaty of international space law, commonly known as the Outer Space Treaty, was opened for signature in which year?
(A) 1957
(B) 1967
(C) 1972
(D) 1984

**115.** Which of the following is a core principle mandated by the Outer Space Treaty?
(A) Space resources must be strictly and equally divided among all nations based on population size
(B) Commercial private enterprises are permanently banned from owning or launching space rockets
(C) Banning weapons of mass destruction in space and on celestial bodies
(D) Only the United Nations Security Council can authorise the launch of commercial satellites

NODIA

**116.** Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
**Assertion (A):** No nation can claim sovereignty over the Moon or any other celestial body.
**Reason (R):** The Outer Space Treaty establishes the non-appropriation principle, stating that outer space is the province of all mankind.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**117.** The Space Liability Convention of 1972 states that:
(A) Individual astronauts are personally liable for any structural damage they cause on celestial bodies
(B) Space agencies must purchase mandatory third-party insurance from the United Nations before liftoff
(C) Launching states are absolutely liable for Earth surface damage
(D) Private commercial companies are fully immune from liability if their satellites collide in orbit

**118.** What is India's legal standing regarding the Outer Space Treaty?
(A) India has signed but not ratified the treaty.
(B) India has ratified the treaty and is fully bound by its provisions.
(C) India has neither signed nor ratified the treaty.
(D) India withdrew from the treaty in 2019 to develop anti-satellite weapons.

**119.** What is the primary overarching goal of the Indian Space Policy 2023?
(A) To completely privatize ISRO operations and sell public space assets to private investors
(B) To restrict all space exploration and satellite activities exclusively to national military purposes
(C) To ban the launch of communication satellites by foreign commercial entities from Indian territory
(D) Encouraging Non-Governmental Entities (NGEs) in space activities

**120.** Under the Indian Space Policy 2023, the term 'NGE' frequently refers to:
(A) Non-Governmental Entities
(B) National Geo-spatial Commercial Enterprises
(C) New Generation Deep Space Explorers
(D) Nodal Government Administrative Establishments

**121.** According to the Indian Space Policy 2023, what is expected to be the primary focus of ISRO moving forward?
(A) Manufacturing routine commercial communication and broadcasting satellites
(B) Operating commercial Direct-To-Home (DTH) television and media services
(C) Focusing on advanced R&D and deep space exploration
(D) Acting as the primary strict regulatory agency for all private space startups

**122.** Under the Indian Space Policy 2023, which entity is tasked with commercializing space technologies and platforms created through public expenditure?
(A) NewSpace India Limited (NSIL)
(B) IN-SPACe
(C) NITI Aayog
(D) Defence Research and Development Organisation (DRDO)

**123.** Recent amendments (2024) to the Foreign Direct Investment (FDI) policy in the space sector allow up to what percentage of FDI under the automatic route for manufacturing components and systems for satellites?
(A) 49%
(B) 74%
(C) 100%
(D) FDI is strictly prohibited in the space sector.

**124.** Antrix Corporation Limited, the older commercial arm of ISRO, was established in which year?
(A) 1980
(B) 1992
(C) 2005
(D) 2019

**125.** Which of the following highlights the functional shift between Antrix Corporation and the newer NSIL?
(A) Antrix focused exclusively on interplanetary science missions, while NSIL focuses on weather satellites
(B) Antrix was a fully private enterprise, whereas NSIL is a wholly government-owned public corporation
(C) Antrix marketed ISRO globally, while NSIL enables industrial ownership
(D) Antrix strictly launched commercial rockets, whereas NSIL exclusively manufactures satellites

**126.** Match List I with List II:
**List I: (Entity)**
P. ISRO
Q. IN-SPACe
R. NSIL
S. IIRS
**List II: (Primary Mandate/Role)**
1. Commercialization of space technology
2. Advanced space R&D and deep space

Downloaded from www.pdf.tube

missions
3. Capacity building and training in remote sensing
4. Authorization and regulation of private space sector

Select the correct answer using the options given below:
(A) P-4, Q-2, R-3, S-1
(B) P-2, Q-1, R-4, S-3
(C) P-1, Q-3, R-2, S-4
(D) P-2, Q-4, R-1, S-3

**127.** The heavy-lift commercial launches by ISRO in 2022 and 2023 for the UK-based company OneWeb were intended to build a satellite constellation for which purpose?
(A) Low Earth Orbit broadband internet
(B) Global satellite navigation and precision positioning services
(C) Deep space astronomical observation and research
(D) Continuous monitoring of atmospheric greenhouse gas emissions

**128.** What launch vehicle was utilized for the commercial OneWeb missions, successfully deploying 36 satellites per launch?
(A) SSLV
(B) $LVM_3$
(C) PSLV-CA
(D) GSLV Mk II

**129.** The TeLEOS-2 satellite, successfully launched by ISRO as a dedicated commercial mission, belonged to which country?
(A) France
(B) Singapore
(C) United States
(D) Australia

**130.** Shukrayaan-1 is an upcoming proposed interplanetary mission by ISRO intended to study which celestial body?
(A) Venus
(B) The Sun
(C) Jupiter
(D) Saturn

**131.** ISRO has formally announced plans to establish the 'Bharatiya Antariksha Station' (Indian Space Station). What is the target year set for its operationalisation?
(A) 2025
(B) 2030
(C) 2035
(D) 2050

**132.** Which of the following represents the correct sequential order of targeted timelines for upcoming major space milestones as directed by the Government of India?
(A) Manned lunar landing → Gaganyaan human spaceflight → Bharatiya Antariksha Station
(B) Gaganyaan human spaceflight → Manned lunar landing → Bharatiya Antariksha Station
(C) Gaganyaan human spaceflight → Bharatiya Antariksha Station → Manned lunar landing
(D) Bharatiya Antariksha Station → Gaganyaan human spaceflight → Manned lunar landing

**133.** Consider the following statements regarding future ISRO missions:
I. SPADEX is an upcoming experiment to demonstrate autonomous space docking and rendezvous technologies.
II. Shukrayaan-1 is planned as an orbiter mission to study the surface and atmosphere of Venus.
III. Bharatiya Antariksha Station (BAS) is targeted to be established by the year 2035.
IV. ISRO plans to send the first Indian astronaut to the Moon by the year 2040.

Which of the above statements is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**134.** By which year has India set the ambitious target of landing its first astronaut on the surface of the Moon?
(A) 2030
(B) 2035
(C) 2040
(D) 2047

**135.** The basic working principle of rocket propulsion in the vacuum of space is primarily based on which law of physics?
(A) Kepler's First and Second Laws of Planetary Motion
(B) Newton's First Law of Motion regarding Inertia
(C) Newton's Law of Universal Gravitation
(D) Newton's Third Law of Motion

NODIA

**136.** What makes a rocket engine explicitly a 'cryogenic' engine?
(A) It uses propellants stored at cryogenic, extremely low temperatures.
(B) It utilizes solid chemical propellants that are cryogenically frozen into a solid fuel block.
(C) It utilizes onboard nuclear radioactive material to heat exhaust gas to extreme temperatures.
(D) It operates cleanly and efficiently without generating any thermal heat in its rocket exhaust.

**137.** In the cryogenic upper stage of ISRO's heavy launch vehicles, liquid hydrogen is typically stored at approximately what temperature?
(A) 0 degrees Celsius
(B) -150 degrees Celsius
(C) -253 degrees Celsius
(D) -273 degrees Celsius (Absolute Zero)

**138.** Which type of solid propellant is most commonly used in the solid rocket motors (like the first stage of PSLV) of ISRO launch vehicles?
(A) HTPB (Hydroxyl-terminated polybutadiene) bound with ammonium perchlorate
(B) UDMH (Unsymmetrical dimethylhydrazine)
(C) Liquid Oxygen (LOX)
(D) Kerosene (RP-1)

**139.** The CE-20 is a highly successful indigenous engine developed by ISRO. In which stage of the $LVM_3$ rocket is this engine utilized?
(A) The solid strap-on boosters ($S_{200}$)
(B) The liquid core stage ($L_{110}$)
(C) The crew escape system
(D) The cryogenic upper stage ($C_{25}$)

**140.** Arrange the following general types of rocket propulsion systems in increasing order of their typical specific impulse (efficiency):
I. Solid propellant engines
II. Ion (electric) thrusters
III. Liquid propellant engines
IV. Cryogenic engines
(A) I, III, IV, II
(B) III, I, IV, II
(C) I, IV, III, II
(D) III, IV, I, II



Click Here to Buy book on Amazon

# ANSWERS

**1.** (C) 1969
The Indian Space Research Organisation was founded on August 15, 1969, superseding the Indian National Committee for Space Research. Operating under the Department of Space, it serves as the primary national agency for space-based applications, space science, and planetary exploration. Its establishment marked a institutionalized shift toward harvesting space technology for overall national socioeconomic development.

**2.** (C) Assertion (A) is true but Reason (R) is false.
The Indian National Committee for Space Research was established in 1962 under Dr. Vikram Sarabhai to initiate space research in India. In 1969, it was superseded by the Indian Space Research Organisation to scale up space activities. The transition was an internal policy decision of the Indian government to institutionalize space developments, not caused by international bodies.

**3.** (B) Department of Space
The Indian Space Research Organisation functions directly under the Department of Space, which reports directly to the Prime Minister of India. Established in 1972, the Department of Space formulates and executes policies regarding space science, technology, and applications. Executive bodies including the Space Commission oversee the implementation of national space goals across various specialized centers and institutions.

**4.** (D) Vikram Sarabhai
Vikram Sarabhai is universally recognized as the founding father of the Indian space programme. He envisioned using space technology for practical societal applications, such as resource mapping and communication. His efforts led to the creation of the Indian National Committee for Space Research and the eventual founding of the Indian Space Research Organisation, shaping India's space trajectory.

**5.** (A) I and II only
India launched its first sounding rocket, Nike-Apache, from Thumba Equatorial Rocket Launching Station in 1963. The Indian National Committee for Space Research was instituted in 1962 under the Department of Atomic Energy. However, Aryabhata, India's first satellite launched in 1975, was placed into orbit using a Soviet Cosmos-3M launch vehicle rather than an indigenous vehicle.

**6.** (A) Bengaluru
The central headquarters of the Indian Space Research Organisation is situated at Antariksh Bhavan in Bengaluru, Karnataka. From this administrative node, the agency coordinates nationwide space operations, satellite development, launch planning, and scientific missions. Bengaluru also hosts key subsidiary establishments, such as the U R Rao Satellite Centre and NewSpace India Limited, centralizing strategic management.

**7.** (C) P-3, Q-4, R-2, S-1
Vikram Sarabhai Space Centre in Thiruvananthapuram leads launch vehicle technology development. U R Rao Satellite Centre in Bengaluru specializes in satellite design and construction. Space Applications Centre in Ahmedabad develops optical and microwave payloads for navigation and communication. Satish Dhawan Space Centre in Sriharikota serves as India's primary spaceport for launching rockets into Earth orbits.

**8.** (A) Design and development of launch vehicles
The Vikram Sarabhai Space Centre, situated in Thiruvananthapuram, Kerala, is the lead facility responsible for the design, research, and development of rocket systems. It played a central role in constructing operational launch vehicles like the Polar Satellite Launch Vehicle, Geosynchronous Satellite Launch Vehicle, and $LVM_3$, along with developing sounding rockets and re-entry vehicle technologies.

**9.** (D) U R Rao Satellite Centre (URSC)
The U R Rao Satellite Centre, located in Bengaluru, serves as the premier lead facility for designing, assembling, integrating, and testing all spacecraft built for national space missions. It oversees the structural development of

NODIA

diverse platforms, including Earth observation, communication, navigation, and deep-space science satellites, facilitating India's growing satellite infrastructure from design through pre-launch operations.

**10.** (B) Its proximity to the equator and east coast location
Sriharikota was selected as India's premier spaceport due to strategic geographic positioning on the eastern coastline near the equator. Its low latitude provides an extra rotational speed boost from the Earth for eastward launches. Additionally, launching eastward over the Bay of Bengal ensures that spent rocket stages and debris fall safely into uninhabited ocean waters.

**11.** (C) Indian Institute of Remote Sensing (IIRS)
The Indian Institute of Remote Sensing in Dehradun focuses primarily on educational capacity building, training, and academic research in geospatial technologies and remote sensing applications. Conversely, facilities such as the Vikram Sarabhai Space Centre, Satish Dhawan Space Centre, and Liquid Propulsion Systems Centre are directly involved in hardware manufacturing, propulsion engine testing, and launch vehicle infrastructure execution.

**12.** (A) SLV-3, ASLV, PSLV, GSLV
The Indian space program developed launch vehicles progressively to increase payload capability and reach higher orbits. The Satellite Launch Vehicle-3 was operationalized in 1980, followed by the Augmented Satellite Launch Vehicle in the late 1980s. The Polar Satellite Launch Vehicle debuted in 1993, while the Geosynchronous Satellite Launch Vehicle was introduced in 2001 for heavy payloads.

**13.** (D) Rohini (RS-1)
In July 1980, India successfully launched the SLV-3 rocket carrying the Rohini RS-1 satellite into orbit from Sriharikota. This milestone made India the sixth nation capable of placing an indigenously manufactured satellite into orbit using a home-grown launch vehicle. Earlier satellites like Aryabhata and Bhaskara were launched using foreign rockets from overseas spaceports.

**14.** (A) Launch Vehicle Mark-3
$LVM_3$ stands for Launch Vehicle Mark-3, previously designated as the Geosynchronous Satellite Launch Vehicle Mark III. It represents India's heaviest operational three-stage launch vehicle, capable of lifting up to four thousand kilograms into Geosynchronous Transfer Orbit. $LVM_3$ features two solid strap-on motors, a core liquid stage, and a powerful indigenous cryogenic upper stage for heavy missions.

**15.** (A) I, II and III only
The Polar Satellite Launch Vehicle primarily injects Earth observation satellites into sun-synchronous polar orbits, while the Geosynchronous Satellite Launch Vehicle targets higher transfer orbits. $LVM_3$ can carry payloads up to four tons to transfer orbits. However, the Small Satellite Launch Vehicle is specially configured for quick turnaround launching of commercial small satellites, not heavy-lift reusable missions.

**16.** (B) Launch-on-demand services for small satellites
The Small Satellite Launch Vehicle was designed to cater to the growing global market for small satellites weighing under five hundred kilograms. It provides low-cost, rapid integration, and launch-on-demand flexibility with minimal launch infrastructure requirements. By shifting smaller commercial payloads to this rocket, heavier operational vehicles like the PSLV remain available for major scientific and institutional space missions.

**17.** (C) Four stages
The Polar Satellite Launch Vehicle is a versatile four-stage launcher developed by India. It features alternating solid and liquid propulsion systems: a solid first stage, liquid second stage, solid third stage, and liquid fourth stage. This versatile multi-stage configuration allows precise orbital placement for a wide range of scientific, Earth observation, and commercial interplanetary space missions.

**18.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The Geosynchronous Satellite Launch Vehicle achieves significantly higher payload capabilities into higher orbits compared to the Polar Satellite Launch Vehicle. This elevated performance is primarily enabled by its high-energy cryogenic upper stage, which uses liquid hydrogen and liquid oxygen. Cryogenic engines provide much

Downloaded from www.pdf.tube

greater specific impulse than conventional solid or hypergolic liquid propulsion stages.

**19.** (C) Solid and Liquid
The four-stage architecture of the Polar Satellite Launch Vehicle uniquely alternates between solid motor and liquid engine propulsion systems. The first stage uses solid propellant supplemented by strap-on boosters, the second stage utilizes the liquid Vikas engine, the third stage employs a solid rocket motor, and the fourth stage features twin liquid-engine thrusters.

**20.** (A) First stage solid, second stage liquid, third stage cryogenic
The operational GSLV Mk II launcher is structured as a three-stage rocket system. The first stage consists of a solid core motor accompanied by four liquid-propellant strap-on boosters. The second stage is powered by a hypergolic liquid Vikas engine, while the third stage uses an indigenously developed cryogenic upper stage operating on liquid hydrogen and oxygen.

**21.** (C) PSLV
The Polar Satellite Launch Vehicle is recognized as ISRO's workhorse for deploying medium-class Earth observation and remote sensing satellites into Sun-synchronous polar orbits. Operating typically between six hundred and eight hundred kilometers altitude, it delivers precise orbital injection accuracy, making it the most cost-effective and optimal choice for medium remote-sensing satellite payloads.

**22.** (B) Cryogenic engines provide much higher specific impulse.
Cryogenic propellant systems, combining liquid hydrogen fuel and liquid oxygen oxidizer, deliver a significantly higher specific impulse than solid or standard liquid propellants. Specific impulse measures propulsion efficiency per unit mass of propellant burned. This high thrust efficiency allows upper stages to carry heavier payloads into high-altitude geostationary transfer orbits without excessive propellant mass.

**23.** (C) Six solid strap-on motors
The PSLV-XL configuration is an upgraded variant of the standard launch vehicle designed for missions requiring higher payload capabilities. It uses six extended solid strap-on motors attached around the first stage core. These larger boosters provide additional initial thrust during liftoff, facilitating interplanetary trajectories like Chandrayaan and heavier satellite deployments into orbit.

**24.** (A) To observe and map Earth's physical features
Earth observation and remote sensing satellites are designed to gather physical and biological data about Earth's surface and atmosphere. Equipped with specialized optical, thermal, and radar sensors, they collect imagery without physical contact. These spatial observations enable detailed mapping of agricultural crops, surface water bodies, land cover changes, forestry resources, and environmental disaster impacts.

**25.** (A) I and II only
Weather satellites occupy geostationary or polar orbits to monitor environmental patterns continuously. Navigation satellites rely on atomic clocks onboard to provide accurate time-stamped signals essential for precise positioning calculations. However, direct-to-home television broadcasting relies primarily on geostationary communication satellites rather than low Earth orbit platforms, ensuring uninterrupted regional coverage from a fixed orbital location.

**26.** (A) Direct-to-Home (DTH) broadcasting
Direct-to-Home broadcasting is a telecommunication service executed through high-power transponders mounted on communication satellites placed in geostationary orbit. In contrast, Earth Observation satellites focus on acquiring physical spatial data. Their core operational applications include mapping groundwater prospective zones, detecting active forest fires, tracking land usage changes, and estimating seasonal crop acreage across regions.

NODIA

**27.** (D) Geostationary orbit
A geostationary orbit is situated directly above the Earth's equator at an altitude of approximately 35,786 kilometers. A satellite orbiting at this altitude completes one revolution in twenty-four hours, matching Earth's rotational period. Consequently, the satellite remains permanently fixed over a specific geographical location, enabling continuous direct communication, media broadcasting, and weather surveillance.

**28.** (B) Astrosat
Astrosat is India's first dedicated multi-wavelength space observatory, launched by

ISRO in September 2015. It carries specialized scientific instruments capable of observing celestial sources simultaneously across optical, ultraviolet, low-energy X-ray, and high-energy X-ray spectral bands. This unique platform enables global astronomers to study cosmic phenomena, star formations, neutron stars, and black holes effectively.

**29.** (C) Telecommunications, broadcasting, and meteorology
The Indian National Satellite system represents a major multipurpose operational satellite network commissioned by India in geostationary orbit. It was designed to meet national requirements in telecommunications, direct-to-home television broadcasting, radio networking, meteorological monitoring, and search-and-rescue operations. This system established a crucial backbone for expanding connectivity and weather monitoring across rural and urban territories.

**30.** (B) GSAT-3
GSAT-3, designated as EDUSAT, was launched by ISRO in September 2004 using the Geosynchronous Satellite Launch Vehicle. It was India's first thematic satellite created specifically to support distance education across school and university networks. Featuring specialized Ku-band and C-band spot beams, EDUSAT enabled interactive distance learning, educational broadcasting, and virtual classrooms nationwide.

**31.** (A) P-4, Q-1, R-3, S-2
GSAT-30 provides telecommunications and direct-to-home broadcasting capabilities in high-frequency bands. Kalpana-1 served as a dedicated satellite monitoring national weather patterns and atmospheric parameters. Cartosat-3 acquires high-resolution optical imagery for urban mapping and topographic planning. The Radar Imaging Satellite series uses synthetic aperture radar to deliver all-weather, day-and-night surface imagery across geographical regions.

**32.** (B) High-speed internet connectivity for remote areas
High Throughput Satellites utilize advanced multi-beam frequency reuse technologies to significantly increase overall data transfer capacity compared to traditional communication spacecraft. Spacecraft like GSAT-11 and GSAT-29 were designed to bridge the digital divide by delivering high-speed satellite broadband connectivity, digital services, and cellular backhaul solutions to rural, isolated, and hilly terrains across India.

**33.** (B) Tata Play
GSAT-24 was configured as a four-ton class Ku-band communication satellite launched by Arianespace on behalf of NewSpace India Limited. Built by ISRO under a demand-driven model, its entire satellite transponder capacity was commercially leased to Tata Play. This arrangement enhanced direct-to-home television broadcast quality and expanded channel carrying capacity for viewers across the nation.

**34.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Satellites within the INSAT series are outfitted with Very High Resolution Radiometers to record meteorological images in visible and infrared spectral bands. These specialized radiometers are deployed because INSAT functions as a multi-purpose operational platform engineered to handle both telecommunications and meteorological forecasting. Continuous weather imaging enables early cyclone tracking, atmospheric monitoring, and disaster management.

**35.** (C) High-resolution Earth observation
The Cartosat satellite family comprises specialized Earth observation spacecraft equipped with advanced panchromatic and multispectral sensors. Their primary operational mandate is capturing high-resolution spatial imagery of Earth's surface. This imagery supports detailed cartographic applications, urban infrastructure planning, land records updating, coastal zone management, boundary surveys, and defense intelligence gathering with exceptional spatial clarity.

**36.** (A) IRS-1A
IRS-1A was launched in March 1988 using a Soviet Vostok launch vehicle, marking the formal beginning of India's operational Earth observation program. Carrying advanced Linear Imaging Self-Scanning sensors operating in visible and near-infrared bands, IRS-1A provided high-quality spatial data. This mission laid the foundation for systematic satellite-based resource management, agricultural planning, and geological surveying.

Click Here to Buy book on Flipkart

**37.** (C) All-weather, day-and-night surface imaging capability
Unlike traditional optical Earth observation satellites that rely on reflected sunlight and clear atmospheric conditions, the Radar Imaging Satellite series employs Synthetic Aperture Radar operating in microwave frequencies. Microwaves penetrate cloud cover, fog, haze, and smoke. This active radar system enables continuous surface imaging under all-weather conditions, operating effectively during both daytime and nighttime.

**38.** (A) I, III and IV only
Cartosat satellites form an integral part of Earth observation operations, utilizing panchromatic sensors to deliver detailed surface imagery. Cartosat-3 achieves an impressive sub-meter spatial resolution of roughly 0.25 meters. However, Cartosat platforms are deployed into low Earth Sun-synchronous polar orbits rather than geostationary orbits, ensuring consistent lighting conditions during global imaging coverage.

**39.** (D) Studying ocean colour and sea surface winds
The Oceansat series consists of specialized Earth observation spacecraft designed specifically for oceanographic applications. Equipped with instruments like Ocean Colour Monitors and Ku-band scatterometers, these satellites record ocean surface temperatures, chlorophyll concentrations, phytoplankton distribution, and sea surface wind vectors. This data supports marine fisheries forecasting, coastal zone management, and climate research.

**40.** (A) NavIC
The Indian Regional Navigation Satellite System was officially given the operational name NavIC, which stands for Navigation with Indian Constellation. Developed by ISRO, NavIC is an independent regional satellite navigation system engineered to deliver accurate real-time positioning, navigation, and timing services across India and surrounding geographical regions without depending on external foreign navigation networks.

**41.** (B) 7 satellites
The primary space segment of the operational NavIC constellation comprises seven active satellites working in coordination. This setup ensures continuous coverage, providing accurate positioning for land, air, and marine transport. Ground support stations continuously monitor and update orbital parameters, enabling precision timing and location accuracy across the designated regional operational area.

**42.** (A) 3 in Geostationary orbit and 4 in Geosynchronous orbit
The seven satellites constituting the baseline NavIC navigation constellation are deployed in high-altitude orbits. Three satellites are positioned in Geostationary orbit over the Indian Ocean, maintaining a stationary viewpoint. The remaining four satellites operate in inclined Geosynchronous orbits, moving in a figure-eight pattern relative to the equator to maximize coverage and positioning precision.

**43.** (A) IV, III, I, II
Satellite navigation systems belong to distinct administrative entities globally. BeiDou is operated by China, Galileo is managed by Europe, NavIC is developed by India, and the Global Positioning System is operated by the United States. Arranging these entities in alphabetical order yields China, Europe, India, and the United States, corresponding to IV, III, I, and II.

**44.** (B) $L_5$ and S bands
NavIC transmits dual-frequency signals to deliver precise positioning services. The constellation utilizes the $L_5$ band operating at 1176.45 MHz and the S band operating at 2492.028 MHz. Transmitting across two distinct frequency bands allows user receivers to measure and correct for atmospheric ionospheric signal delays, thereby improving positioning accuracy across diverse terrain conditions.

**45.** (C) Indian landmass and 1,500 km beyond its borders
The primary service region of the NavIC constellation focuses on delivering reliable coverage across the entire Indian landmass. Additionally, its signal footprint extends up to 1,500 kilometers beyond the national territorial boundaries. This strategic regional coverage caters to terrestrial transportation, marine navigation, disaster management, aviation, and defense security requirements across South Asia.

Downloaded from www.pdf.tube

**46.** (D) Detection of water molecules on the lunar surface
Launched in October 2008, Chandrayaan-1 was India's first deep-space lunar orbiter mission. Its most famous scientific achievement was confirming the presence of water molecules and hydroxyl radicals on the lunar surface. This discovery was made using the Moon Mineralogy Mapper payload provided by NASA, fundamentally altering scientific understanding of lunar geology and resource availability.

**47.** (A) Vikram and Pragyan
In the Chandrayaan-2 mission launched in 2019, the spacecraft comprised an orbiter, lander, and rover. The lander was named Vikram in honor of Vikram Sarabhai, the pioneer of India's space program. The robotic six-wheeled rover was named Pragyan, derived from the Sanskrit word for wisdom, designed to perform elemental analysis of lunar soil.

**48.** (A) I and II only
Chandrayaan-3 achieved a historic soft landing near the lunar south pole in August 2023. The touchdown location was officially designated as Shiv Shakti Point. However, the spacecraft was launched into space using the $LVM_3$-$M_4$ heavy launch vehicle from Sriharikota, rather than the PSLV-C55 rocket, providing the required payload capacity for lunar insertion.

**49.** (B) $LVM_3$ (GSLV Mk III)
ISRO utilized the $LVM_3$ rocket for the Chandrayaan-3 lunar mission. This heavy-lift launcher features dual solid S200 strap-on boosters, a core liquid $L_1$10 stage, and a cryogenic upper stage. The vehicle successfully injected the propulsion module and lander assembly into an elliptical Earth parking orbit before the spacecraft initiated its multi-stage transit toward the Moon.

**50.** (A) Solar panels
The Pragyan rover deployed during the Chandrayaan-3 lunar mission relied entirely on solar panels mounted on its chassis for electrical power generation. During the fourteen Earth days of lunar daylight, solar energy powered the rover's wheels, navigation cameras, processing systems, and scientific payloads, enabling in-situ chemical and elemental analysis of lunar surface regolith.

**51.** (C) Communication with the spacecraft was lost
Chandrayaan-1 operated in lunar orbit for nearly ten months starting in October 2008, completing over ninety percent of its intended scientific goals. The mission officially ended in August 2009 when ground controllers suddenly lost radio communication with the spacecraft due to thermal isolation issues and orientation failures, causing the orbiter to drift passively around the Moon.

NODIA

**52.** (C) 2013
The Mars Orbiter Mission, popularly known as Mangalyaan, was launched by ISRO on November 5, 2013. The spacecraft executed a trans-Mars injection maneuver after several orbit-raising maneuvers around Earth, entering Martian orbit on September 24, 2014. This achievement established India as a leading nation in interplanetary exploration using cost-effective spacecraft designs and efficient launch trajectories.

**53.** (C) PSLV-$C_{25}$
India's Mars Orbiter Mission was launched aboard the PSLV-$C_{25}$ rocket in its XL configuration, equipped with six extended solid strap-on boosters. The launcher delivered the spacecraft into an elliptical Earth parking orbit. Subsequent fuel-efficient burn maneuvers incrementally expanded the orbit until the probe attained sufficient escape velocity to begin its interplanetary cruise toward Mars.

**54.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Mangalyaan was inserted into a highly elliptical orbit around Mars, characterized by a periapsis of hundreds of kilometers and an apoapsis of tens of thousands of kilometers. Entering an elliptical orbit required a much smaller velocity reduction maneuver, conserving precious onboard propellant and satisfying overall spacecraft weight constraints while still allowing global scientific imaging.

**55.** (D) First nation to reach Martian orbit on maiden attempt
Upon successfully entering orbit around Mars in September 2014, ISRO became the first space agency in the world to reach Martian orbit on its initial attempt. Furthermore, India became the fourth space entity globally to reach Mars, accomplishing this interplanetary feat at a

remarkably low financial cost compared to contemporary missions undertaken by other space agencies.

**56.** (A) Methane Sensor for Mars (MSM)
The Methane Sensor for Mars payload on Mangalyaan was specially designed to detect trace amounts of atmospheric methane in the Martian environment. Methane serves as a key biosignature gas associated with potential microbial biological processes or geological activities. The sensor measured solar radiation absorption in specific spectral bands to map potential localized methane sources across the surface.

**57.** (C) A long eclipse that exhausted its battery capacity
After operating successfully for nearly eight years beyond its planned six-month lifespan, the Mars Orbiter Mission formally concluded in April 2022. The probe encountered a prolonged orbital eclipse that cut off solar illumination to its panels. This extended shadow period completely drained the spacecraft's backup battery, causing a total loss of power and communication capability.

**58.** (A) To demonstrate human spaceflight capability to Low Earth Orbit
The primary objective of ISRO's Gaganyaan programme is demonstrating indigenous human spaceflight capability to low Earth orbit. The mission involves carrying Indian astronauts into an orbit around four hundred kilometers altitude, sustaining life systems in space, and executing a safe atmospheric re-entry with controlled sea landing recovery, establishing India's long-term human space exploration foundation.

**59.** (B) 3 members for 3 days
The baseline human spaceflight mission under the Gaganyaan programme aims to launch a crew of three astronauts into low Earth orbit for a planned duration of three days. During orbit, the crew module will maintain environmental control and life support systems before initiating re-entry procedures to return the astronauts safely to Earth via ocean touchdown.

**60.** (B) II only
The Gaganyaan mission utilizes the Human-Rated $LVM_3$ rocket, designated as $HLVM_3$, rather than the lighter PSLV launcher, to carry the heavy orbital module. The crew module features re-entry shielding and water landing recovery systems. Additionally, the half-humanoid robot Vyommitra tests environmental control systems during uncrewed test flights at an orbital altitude of four hundred kilometers.

**61.** (C) A half-humanoid robot for uncrewed test missions
Vyommitra is a female-looking half-humanoid robot developed by ISRO for uncrewed test flights preceding human astronaut launches in the Gaganyaan program. Equipped with artificial intelligence, Vyommitra can monitor cabin parameters, operate control panels, respond to ground commands, and simulate human physiological functions to ensure full atmospheric and life-support reliability before crewed missions commence.

**62.** (D) Crew Escape System (CES)
The Crew Escape System is a critical safety mechanism integrated into the Human-Rated $LVM_3$ launch vehicle for the Gaganyaan mission. Powered by high-thrust solid rocket motors, it can pull the astronaut crew module quickly away to a safe distance from the rocket in the event of any catastrophic malfunction or emergency anomaly during liftoff or early ascent phases.

**63.** (A) To study the solar atmosphere and corona
Aditya-$L_1$ is India's pioneer solar observatory spacecraft deployed to study the dynamics of the Sun. Its primary scientific objectives focus on analyzing solar coronal heating, coronal mass ejections, solar wind origin, space weather patterns, and magnetic field variations. These continuous solar observations help scientists understand solar activity impacts on satellite communications and Earth's space weather environment.

**64.** (B) Lagrange Point 1
In the Aditya-$L_1$ mission, $L_1$ refers to the First Lagrange Point within the Sun-Earth gravitational system. Lagrange points represent equilibrium locations in space where the gravitational forces exerted by two massive bodies balance the centripetal force required for a smaller object to orbit with them, allowing spacecraft to remain in stable halo orbits with minimal fuel consumption.

Click Here to Buy book on Amazon

**65.** (A) 1.5 million kilometers
The First Lagrange Point is positioned approximately 1.5 million kilometers away from Earth towards the Sun, representing roughly one percent of the total distance between Earth and Sun. Placing Aditya-$L_1$ in a halo orbit around this equilibrium point provides an unobstructed, continuous view of the Sun without any atmospheric interference or planetary eclipse shadow periods.

**66.** (A) P-2, Q-1, R-4, S-3
The Visible Emission Line Coronagraph observes the high-altitude solar corona and coronal mass ejections. The Solar Ultraviolet Imaging Telescope images the solar photosphere and chromosphere across ultraviolet bands. ASPEX measures solar wind ions and energy distributions, while PAPA analyzes plasma characteristics and thermal electron parameters, enabling comprehensive multi-spectrum solar wind analysis from Lagrange Point 1.

**67.** (C) VELC
The Visible Emission Line Coronagraph is the primary and largest payload aboard the Aditya-$L_1$ spacecraft. Designed and constructed by the Indian Institute of Astrophysics, VELC acts as an internally occulted solar coronagraph. It continuously images the solar corona close to the solar limb, studying velocity fields, temperature distribution, and dynamic spectral signatures of coronal mass ejections.

**68.** (D) PSLV-C57
Aditya-$L_1$ was launched into space by ISRO using the PSLV-C57 rocket in September 2023. The vehicle successfully injected the spacecraft into an initial elliptical Earth parking orbit. Subsequent liquid-engine burns gradually expanded the trajectory, enabling the spacecraft to leave Earth's sphere of influence and journey four months toward its operational halo orbit around Lagrange Point 1.

**69.** (C) Kessler Syndrome
The Kessler Syndrome describes a theoretical scenario where the concentration of orbital space debris in Low Earth Orbit becomes high enough that collisions between objects generate a cascading domino effect. Each collision produces additional fragments, exponentially increasing orbital collision probability until specific orbital altitudes become hazardous and virtually unusable for functioning operational satellites or space exploration platforms.

NODIA

**70.** (B) Project NETRA
Project NETRA, standing for Network for space object Tracking and Analysis, is an initiative by ISRO to safeguard Indian satellites from space debris and collision threats. It integrates radar units, optical tracking telescopes, and control centers to detect, track, and catalogue orbital debris, providing collision avoidance warnings to protect operational Indian spacecraft across orbits.

**71.** (D) A super-synchronous orbit above GEO for retired satellites
A graveyard orbit is a specialized disposal orbit located several hundred kilometers above Geostationary Earth Orbit. When geostationary satellites approach the end of their operational lifespan, remaining propellant is used to maneuver them into this super-synchronous graveyard orbit. This prevents dead satellites from drifting in operational GEO slots and creating dangerous collision hazards with active telecommunication satellites.

**72.** (A) Radar and Optical telescopes
Ground-based tracking of space debris in Earth orbit relies primarily on complementary radar systems and optical telescopes. Radar facilities emit high-power microwave pulses effective for detecting and tracking small debris in low Earth orbit during day or night. Optical telescopes capture sunlight reflected off space objects, making them ideal for tracking inactive satellites in higher geostationary orbits.

**73.** (C) II and III only
Low Earth orbit mitigation guidelines mandate de-orbiting satellites within twenty-five years of mission conclusion. Geostationary satellites are boosted into higher graveyard orbits rather than de-orbited into Earth's oceans due to extreme delta-v requirements. Furthermore, Project NETRA functions purely as a ground-based tracking and surveillance network, containing no operational orbital laser weaponry to destroy space debris fragments.

**74.** (A) To share debris research and suggest mitigation guidelines
The Inter-Agency Space Debris Coordination Committee is an international governmental

forum comprising major world space agencies. Its principal purpose is facilitating technical information exchange on space debris research, promoting debris mitigation measures, and establishing international guidelines to reduce orbital debris accumulation, thereby preserving long-term space access and orbital sustainability for spacefaring nations.

**75.** (D) Department of Space
NewSpace India Limited was incorporated in March 2019 as a wholly owned Central Public Sector Enterprise operating under the administrative jurisdiction of the Department of Space. It was created to serve as the commercial arm of ISRO, driving commercial participation, technology transfers, rocket manufacturing, and satellite launch operations within the expanding Indian space industry.

**76.** (B) To commercially exploit ISRO's R&D outputs
NewSpace India Limited is mandated to commercially leverage the research, development, and technological infrastructure created by the Indian Space Research Organisation. Its primary activities include building launch vehicles through Indian industry partnerships, executing commercial launch services for global customers, transferring space technologies to private firms, and acquiring satellite transponder capacity for commercial operational utilization.

**77.** (C) Indian National Space Promotion and Authorization Centre
IN-SPACe stands for the Indian National Space Promotion and Authorization Centre. Established as an autonomous single-window nodal agency under the Department of Space, it acts as a regulator and promoter for non-governmental private entities engaging in space activities, authorizing satellite launches, rocket manufacturing, ground station setup, and space facility sharing.

**78.** (D) Vikram-S
Launched in November 2022 under Mission Prarabdh, Vikram-S became India's first privately developed launch vehicle. Built by the Hyderabad-based space startup Skyroot Aerospace, this single-stage sub-orbital sounding rocket demonstrated key propulsion systems, avionics, telemetry, and 3D-printed engine components, ushering in a new era of private rocket development and commercial participation in India.

**79.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
IN-SPACe functions as an independent, single-window regulatory agency created to streamline approvals and promote private industrial growth in the space domain. It fulfills this authorization mandate by permitting non-governmental entities to access and utilize ISRO's specialized technical testing facilities, launch complexes, and research infrastructure, reducing barrier costs for private aerospace enterprises.

**80.** (B) Agnikul Cosmos
Agnilet is a single-piece 3D-printed semi-cryogenic rocket engine developed by Chennai-based space startup Agnikul Cosmos. Designed to power their customizable Agnibaan launch vehicle, the engine utilizes aviation turbine fuel alongside liquid oxygen. Manufacturing the entire thrust chamber as a single 3D-printed component significantly reduces component count, assembly complexity, and manufacturing lead times.

**81.** (B) NASA (National Aeronautics and Space Administration)
NISAR, which stands for NASA-ISRO Synthetic Aperture Radar, is a joint Earth observation mission between ISRO and NASA. The spacecraft incorporates dual-frequency Synthetic Aperture Radar systems operating in L-band and S-band frequencies. It is engineered to map global land surface deformations, ice-sheet changes, ecosystem dynamics, and natural hazard impacts with high resolution.

**82.** (A) France (CNES)
The TRISHNA mission is a joint collaborative Earth observation initiative developed by ISRO and France's space agency, CNES. Short for Thermal InfraRed Imaging Satellite for High-resolution Natural Resource Assessment, TRISHNA is designed to acquire high-resolution thermal infrared imagery to monitor global water resources, land surface temperature variations, evapotranspiration rates, and urban heat dynamics.

Downloaded from www.pdf.tube

**83.** (A) Signing the Outer Space Treaty, Launching the first foreign satellite on PSLV, Signing the Artemis Accords
India signed and ratified the landmark UN Outer Space Treaty in 1967. Decades later, ISRO executed its first commercial foreign satellite launch using the PSLV-$C_2$ in 1999, deploying South Korean and German satellites. In June 2023, India signed the Artemis Accords, reflecting a chronological progression in international space governance and collaborative exploration.

**84.** (D) JAXA
The Lunar Polar Exploration Mission, known as LUPEX, is a planned joint lunar exploration mission between ISRO and Japan's space agency, JAXA. The mission aims to land a rover near the lunar south pole to investigate water ice deposits, surface drill samples, and environmental conditions, combining an ISRO-developed lander with a JAXA-developed rover.

**85.** (C) Framework for peaceful lunar and space exploration
The Artemis Accords represent a non-binding multilateral agreement establishing principles for civil space exploration and resource utilization. Grounded in the 1967 Outer Space Treaty, the accords emphasize peaceful space activities, scientific data transparency, orbital emergency assistance, interoperability of exploration systems, and sustainable usage of lunar and outer space resources among participating nations.

**86.** (D) 35,786 km
A Geostationary Earth Orbit is located at a precise altitude of approximately 35,786 kilometers directly above Earth's equator. Satellites orbiting at this specific altitude travel at a velocity matching Earth's rotation speed around its axis. As a result, spacecraft in this orbit appear stationary relative to fixed ground stations on Earth's surface.

**87.** (D) The satellite crosses the equator at the same local solar time during every pass
A Sun-synchronous orbit is a near-polar orbit engineered so that the satellite passes over any given spot on Earth's surface at the exact same local solar time every day. This orbital inclination causes precession that matches Earth's orbital movement around the Sun, ensuring consistent surface illumination conditions critical for comparative Earth observation imagery.

**88.** (D) I, II, III and IV
Low Earth Orbit encompasses altitudes up to two thousand kilometers. Medium Earth Orbit typically hosts global navigation constellations such as GPS and GLONASS. Geostationary Orbit features an orbital period of twenty-four hours matching Earth's rotation, while Sun-synchronous orbits represent inclined polar orbits optimized for consistent optical surface imaging across seasonal transitions.

NODIA

**89.** (C) 90 degrees
An orbit is classified as a polar orbit when its orbital plane possesses an inclination of approximately ninety degrees relative to Earth's equatorial plane. A spacecraft in a polar orbit passes over Earth's north and south polar regions during each revolution, allowing Earth to rotate underneath and granting full planetary surface coverage over consecutive orbits.

**90.** (C) 24 hours
A satellite placed in Geostationary orbit requires approximately twenty-four hours (specifically twenty-three hours, fifty-six minutes, and four seconds) to complete one full revolution around Earth. Because this period equals Earth's sidereal rotation period, the satellite maintains a fixed position relative to ground receivers, enabling uninterrupted telecommunication and weather monitoring services.

**91.** (D) GEO has zero inclination (equatorial), while GSO can have inclination
Both Geosynchronous and Geostationary orbits possess an orbital period matching Earth's twenty-four-hour rotation. However, a Geostationary orbit is a circular orbit situated strictly in Earth's equatorial plane with zero inclination, keeping the satellite stationary overhead. A Geosynchronous orbit can possess an inclination angle relative to the equator, causing the satellite to trace a figure-eight path in the sky.

**92.** (B) To receive, amplify, frequency-shift, and retransmit signals
A transponder is a core electronic subsystem integrated into communication satellites. Its primary functional role involves receiving weak radio signals transmitted from Earth ground stations, amplifying the signal power, shifting the carrier frequency to avoid signal interference,

and retransmitting the processed data back down to ground antennas across target coverage zones.

**93.** (C) P-1, Q-2, R-3, S-4
Radio frequency bands are categorized by specific frequency ranges. L-band operates between 1 and 2 GHz, heavily utilized in navigation. C-band operates between 4 and 8 GHz, providing rain-resistant telecommunication links. Ku-band ranges from 12 to 18 GHz, serving direct-to-home broadcasting. Ka-band operates between 26 and 40 GHz, enabling high-bandwidth satellite internet services.

**94.** (D) Ku-band
Direct-To-Home television broadcasting services in India primarily utilize Ku-band frequencies, operating within the 12 to 18 GHz spectrum. The shorter wavelengths of Ku-band enable signals to be captured effectively using small dish antennas installed at consumer premises, facilitating widespread media distribution without requiring massive ground receiving dishes required by lower frequency signals.

**95.** (A) Ku and Ka bands
Rain fade refers to the attenuation and degradation of satellite signals caused by atmospheric precipitation. Higher frequency radio bands, particularly Ku-band and Ka-band, feature wavelengths comparable in size to raindrops. Consequently, heavy rainfall, atmospheric moisture, and storm clouds absorb and scatter these microwave signals, leading to temporary signal degradation or service interruptions.

**96.** (B) High resilience to weather attenuation like rain
Although C-band requires larger receiving dish antennas due to its longer radio wavelengths, it remains essential for critical satellite communication. Its principal technical advantage is exceptional resilience against rain fade and atmospheric attenuation. This durability makes C-band highly reliable for tropical regions experiencing heavy monsoon rainfall, ensuring continuous television feed relays and telecommunication links.

**97.** (B) 36 MHz
In satellite communication engineering, a standard transponder equivalent traditionally corresponds to a spectral bandwidth of 36 MHz. Satellite overall capacity is frequently measured in terms of 36 MHz equivalent transponders. This standardized bandwidth block can accommodate multiple compressed television channels, radio broadcasts, or multiplexed digital data streams operating across given satellite footprints.

**98.** (A) Bhuvan
Bhuvan is a geoportal developed by ISRO that provides multi-scale, 2D and 3D satellite imagery and geospatial services covering the Indian subcontinent. It facilitates spatial data visualization, urban planning, environmental monitoring, and real-time disaster management, allowing government agencies and citizens to assess flood extents, landslide risks, and infrastructure assets effectively.

**99.** (C) Penetrates clouds and operates day/night for imaging
Synthetic Aperture Radar sensors mounted on satellites like RISAT are invaluable during flood disasters because they operate in microwave frequencies. Unlike optical sensors restricted by daylight and cloud cover, active radar pulses penetrate dense storm clouds, torrential rain, and nighttime darkness. This ensures continuous, clear surface mapping of inundation boundaries during peak monsoon flooding events.

**100.** (D) I, II and III
Synthetic Aperture Radar penetrates heavy clouds during monsoons to delineate flooded areas. Thermal infrared sensors detect thermal anomalies to spot and track active forest fires. Geostationary meteorological satellites offer continuous atmospheric observation to monitor storm formations and track cyclone trajectories, confirming that space systems play complementary roles in disaster warning and response.

**101.** (C) Provide space data delivery to disaster-affected nations
The International Charter Space and Major Disasters is a worldwide collaborative agreement among space agencies, including ISRO. Its core objective is making satellite imagery and geospatial data freely available to emergency management authorities in regions hit by major natural disasters, aiding rapid damage assessment, relief coordination, search-and-rescue operations, and post-disaster rehabilitation planning.

Click Here to Buy book on Flipkart

**102.** (B) Thermal infrared sensors
Thermal infrared sensors are specifically calibrated to detect infrared electromagnetic radiation emitted by heat sources on Earth's surface. In forest fire management, these sensors identify surface thermal anomalies and active fire hotspots through dense smoke cover, enabling emergency agencies to track wildfire movement, map burning intensity, and direct firefighters effectively.

**103.** (D) Provide pre-harvest crop production forecasts nationally
The FASAL project is a major national initiative operated by the Ministry of Agriculture in collaboration with ISRO. It integrates remote sensing imagery, meteorological data, and land-based observations to generate accurate pre-harvest crop production forecasts. These forecasts assist policy planners in assessing agricultural output, managing food security stocks, and formulating trade policies.

**104.** (A) Normalized Difference Vegetation Index
NDVI stands for Normalized Difference Vegetation Index, a standardized remote sensing metric used to assess green vegetation density and health. Calculated from red and near-infrared reflectance values, healthy chlorophyll-rich vegetation absorbs visible red light and strongly reflects near-infrared light. NDVI maps allow researchers to monitor crop vigor, detect drought stress, and estimate biomass.

**105.** (C) INSAT/GSAT satellites
Meteorological payloads such as Imagers and Sounders are routinely integrated into ISRO's INSAT and GSAT geostationary satellite platforms. The Imager records optical and thermal images of cloud movements and surface temperatures, while the Sounder measures atmospheric temperature and moisture profiles at various altitudes, providing vital observational inputs for weather forecasting and tropical cyclone tracking.

**106.** (C) II, IV, I, III
Satellite-based crop yield forecasting follows a structured sequence. First, raw satellite imagery is acquired and corrected for atmospheric distortion. Next, crop classification algorithms mask non-agricultural land areas. Then, vegetative indices like NDVI are extracted across targeted crop boundaries. Finally, these derived indices are integrated into empirical growth models to formulate accurate crop yield estimates.

**107.** (D) Horticulture crops
Project CHAMAN, which stands for Coordinated Horticulture Assessment and Management using geoinformatics, uses space technology and GIS applications to support India's horticulture sector. It provides reliable spatial inventory data, crop acreage estimates, and site-suitability assessments for major horticultural crops including fruits, vegetables, and spices, promoting targeted agricultural development and cold-chain infrastructure planning.

**108.** (B) Soil moisture
Microwave satellite sensors operate at frequencies sensitive to variations in dielectric properties between dry soil and liquid water. By measuring surface microwave emissions or radar backscatter, these sensors directly estimate upper soil moisture levels regardless of cloud conditions. This spatial soil moisture data enables agricultural authorities to optimize irrigation scheduling and manage regional drought vulnerabilities.

**109.** (C) Jodhpur
The State Remote Sensing Application Centre of Rajasthan is headquartered in Jodhpur. Established to leverage spatial technology for state administration, SRSAC utilizes satellite remote sensing imagery and Geographic Information Systems to map natural resources, assist urban planning, analyze land usage patterns, monitor wasteland areas, and support hydrological studies across Rajasthan's arid terrain.

**110.** (D) Department of Science & Technology
The State Remote Sensing Application Centre in Jodhpur functions under the administrative control of the Department of Science & Technology, Government of Rajasthan. It acts as the nodal agency for remote sensing and GIS applications within the state, collaborating with various government departments to integrate spatial data into governance, resource management, and regional development plans.

**111.** (A) I and II only
The State Remote Sensing Application Centre provides vital geospatial solutions to state

NODIA

government entities. Satellite imagery plays a critical role in monitoring desertification dynamics and evaluating sand dune stabilization across the Thar region. Ground water prospect mapping in Rajasthan relies extensively on remote sensing and hydrogeological spatial analysis rather than being prohibited.

**112.** (A) I, II and IV only
Remote sensing applications executed by Rajasthan state agencies concentrate on land and natural resource governance. Key operational uses include mapping wastelands, tracking desertification, monitoring environmental impacts from mining along the Aravalli range, and assessing seasonal crop acreage for drought planning. Deep ocean wind forecasting falls under national meteorological bodies rather than state remote sensing applications.

**113.** (B) Developing GIS and satellite data skills for governance
The Rajiv Gandhi Centre of Advanced Technology in Rajasthan functions as a technology capacity-building institute. In space technology applications, such institutes provide specialized training in Geographic Information Systems, satellite remote sensing, and spatial data analytics. Building technical expertise among administrative professionals facilitates data-driven governance, efficient urban planning, and resource management across state departments.

**114.** (B) 1967
The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, was opened for signature in January 1967. Entering into force in October 1967, this foundational treaty forms the core framework of international space law, establishing basic legal principles governing peaceful orbital exploration.

**115.** (C) Banning weapons of mass destruction in space and on celestial bodies
A fundamental mandate of the 1967 Outer Space Treaty is prohibiting state parties from placing nuclear weapons or any other weapons of mass destruction into Earth orbit, installing them on celestial bodies, or stationing them in outer space. The treaty restricts celestial body utilization exclusively to peaceful purposes, explicitly forbidding military bases, weapons testing, or military maneuvers.

**116.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
International space law strictly prohibits national sovereignty claims over the Moon or celestial bodies through occupation, appropriation, or any other means. The Outer Space Treaty establishes the core non-appropriation principle, declaring that outer space is free for exploration by all nations without discrimination and belongs to humanity as a common province for peaceful utilization.

**117.** (C) Launching states are absolutely liable for Earth surface damage
The 1972 Convention on International Liability for Damage Caused by Space Objects establishes international legal liability rules. Under this treaty, a launching state is absolutely liable to pay compensation for loss of life, personal injury, or property damage caused by its space objects on the surface of the Earth or to aircraft in flight, regardless of fault.

NODIA

**118.** (B) India has ratified the treaty and is fully bound by its provisions.
India signed the Outer Space Treaty in March 1967 and formally ratified it in August 1982. As a ratifying state party, India is fully bound by its provisions, adhering to international principles regarding non-appropriation of celestial bodies, peaceful space exploration, state responsibility for space objects, and prohibition of weapons of mass destruction in Earth orbit.

**119.** (D) Encouraging Non-Governmental Entities (NGEs) in space activities
The Indian Space Policy 2023 provides an overarching framework aimed at unlocking commercial capabilities in the space sector. A primary objective is promoting private sector participation by encouraging Non-Governmental Entities to conduct end-to-end space activities, including launch vehicle development, satellite operations, and commercial ground infrastructure, while enabling ISRO to focus on advanced research.

**120.** (A) Non-Governmental Entities
In the context of Indian space policy documents and regulatory guidelines, NGE stands for Non-Governmental Entities. This legal classification encompasses private sector commercial enterprises, academic research institutions, industrial consortiums, and technology

startups active in developing space systems, manufacturing components, building ground stations, or delivering commercial satellite application services across the domestic economy.

**121.** (C) Focusing on advanced R&D and deep space exploration
Under the Indian Space Policy 2023, ISRO shifts away from routine commercial manufacturing and operational satellite servicing. Moving forward, the agency focuses primarily on advanced space research, deep space scientific missions, development of cutting-edge propulsion systems, human spaceflight programs, and technology sharing, enabling private industry to manage standardized satellite operations and commercial launch services.

**122.** (A) NewSpace India Limited (NSIL)
Under the Indian Space Policy 2023, NewSpace India Limited serves as the primary public sector enterprise responsible for commercializing space technologies and platforms created through public expenditure. NSIL manages commercial satellite manufacturing, payload leasing, technology licensing from ISRO to private entities, and launcher procurement, driving commercial operational activities within the domestic space economy.

**123.** (C) 100%
In 2024, the Government of India liberalized Foreign Direct Investment rules in the space sector to attract foreign investment and encourage industrial growth. Under the revised policy, up to 100 percent FDI is permitted under the automatic route for manufacturing satellite components, ground systems, and specialized sub-assemblies without requiring prior government approval.

**124.** (B) 1992
Antrix Corporation Limited was incorporated in September 1992 as the initial commercial arm of the Indian Space Research Organisation. Operating under the administrative control of the Department of Space, Antrix was created to market ISRO's space products, technical services, satellite capabilities, and commercial launch services using the PSLV to global commercial customers.

**125.** (C) Antrix marketed ISRO globally, while NSIL enables industrial ownership
Antrix Corporation primarily functioned as an export marketing arm selling ISRO products, spatial data, and launch services abroad. In contrast, NewSpace India Limited possesses a broader mandate, acquiring demand-driven satellites, owning space platforms, and enabling Indian private industry to build launch vehicles and manufacture space components, thereby building full industrial capability within the country.

**126.** (D) P-2, Q-4, R-1, S-3
ISRO leads scientific research and deep-space missions. IN-SPACe serves as the regulator authorizing private sector space activities. NewSpace India Limited drives the commercialization of satellite services and launcher procurement. The Indian Institute of Remote Sensing delivers professional training and academic capacity building in geospatial applications and satellite data interpretation.

**127.** (A) Low Earth Orbit broadband internet
The commercial launches executed by ISRO for OneWeb involved deploying dozens of communication satellites into Low Earth Orbit. OneWeb designed this large orbital constellation to provide global high-speed, low-latency broadband internet connectivity. This system delivers digital access to remote regions, maritime vessels, aviation routes, and isolated communities lacking traditional terrestrial fiber network connectivity.

**128.** (B) $LVM_3$
ISRO deployed the heavy-lift $LVM_3$ launcher for commercial OneWeb missions. Operating under commercial agreements signed with NewSpace India Limited, the $LVM_3$ rocket successfully deployed thirty-six OneWeb broadband satellites into low Earth orbit per launch. These commercial missions demonstrated $LVM_3$'s reliability, multi-satellite separation capability, and international competitiveness in the global commercial launch market.

**129.** (B) Singapore
TeLEOS-2 is a commercial Earth observation satellite built for Singapore, launched by ISRO in April 2023 aboard the PSLV-C55 rocket. Carrying a Synthetic Aperture Radar payload capable of all-weather, day-and-night imaging,

Downloaded from www.pdf.tube

TeLEOS-2 provides high-resolution spatial coverage for satellite maritime monitoring, urban planning, environmental surveillance, and disaster response requirements for Singapore entities.

**130.** (A) Venus
Shukrayaan-1 is a planned interplanetary scientific orbiter mission proposed by ISRO to study Venus. The mission aims to investigate Venusian atmospheric dynamics, surface chemistry, volcanic activity, and surface-atmosphere interactions. Carrying radar and optical spectrometers, Shukrayaan-1 will analyze the dense carbon dioxide atmosphere and cloud layer surrounding the planet.

**131.** (C) 2035
The Indian government has directed ISRO to construct and operationalize the Bharatiya Antariksha Station by 2035. Envisioned as an autonomous space station in Low Earth Orbit, it will feature modular laboratory modules supporting microgravity scientific experiments, space biology research, technological tests, and human astronaut habitat operations, advancing India's presence in space exploration.

**132.** (C) Gaganyaan human spaceflight → Bharatiya Antariksha Station → Manned lunar landing
India's long-term human space exploration roadmap follows a progressive structural sequence. The immediate priority is executing the initial Gaganyaan human spaceflight mission to Low Earth Orbit. Building on this capability, India plans to construct the Bharatiya Antariksha Station by 2035, culminating in sending the first Indian astronaut for a manned lunar landing by 2040.

**133.** (D) I, II, III and IV
SPADEX demonstrates autonomous space docking technologies vital for orbital platforms. Shukrayaan-1 will study the surface and atmosphere of Venus. The Bharatiya Antariksha Station is planned for operational deployment by 2035, while government targets aim to land an Indian astronaut on the Moon by 2040, demonstrating a cohesive strategy for future exploration.

**134.** (C) 2040
The Government of India has established 2040 as the target year for landing the first Indian astronaut on the Moon's surface. Achieving this milestone requires developing heavy Next-Generation Launch Vehicles, advanced lunar landing systems, life support modules, and deep-space communication infrastructure, extending capabilities demonstrated during automated Chandrayaan and Gaganyaan human spaceflight missions.

NODIA

**135.** (D) Newton's Third Law of Motion
Rocket propulsion in the vacuum of space operates strictly on Newton's Third Law of Motion, which states that every action generates an equal and opposite reaction. High-pressure gas produced by burning chemical propellants is continuously expelled backward through a nozzle at high velocity, creating reactive thrust that accelerates the rocket forward through space.

**136.** (A) It uses propellants stored at cryogenic, extremely low temperatures.
A cryogenic rocket engine is defined by its utilization of propellants stored in liquid form at extremely low cryogenic temperatures. Typically employing liquid hydrogen fuel and liquid oxygen oxidizer, these propellants require specialized insulated storage tanks, cryo-pumps, and complex thermal management systems to maintain their liquid state prior to combustion in the thrust chamber.

**137.** (C) -253 degrees Celsius
In the cryogenic upper stage of ISRO launch vehicles like $LVM_3$, liquid hydrogen serves as the primary rocket fuel. Liquid hydrogen must be maintained at an extremely low temperature of approximately minus 253 degrees Celsius to remain in liquid form. Liquid oxygen, acting as the oxidizer, is stored alongside at roughly minus 183 degrees Celsius.

**138.** (A) HTPB (Hydroxyl-terminated polybutadiene) bound with ammonium perchlorate
ISRO's solid rocket boosters, such as the PSLV first stage and $LVM_3$ $S_{200}$ strap-on motors, utilize Hydroxyl-terminated polybutadiene as the binder and fuel base mixed with ammonium perchlorate as the oxidizer. Powdered aluminum is added as metallic fuel to enhance flame temperature and thrust efficiency, producing high thrust during liftoff.

**139.** (D) The cryogenic upper stage ($C_{25}$)
The CE-20 is an indigenously developed cryogenic engine designed and built by ISRO. Operating on a gas-generator cycle with liquid hydrogen and liquid oxygen, it powers the $C_{25}$ cryogenic upper stage of the $LVM_3$ rocket. The engine generates high thrust in vacuum, enabling $LVM_3$ to deliver heavy communication satellites into Geosynchronous Transfer Orbit.

**140.** (A) I, III, IV, II
Specific impulse measures engine propulsion efficiency. Solid propellant rockets possess the lowest specific impulse among chemical engines, followed by hypergolic liquid propellant engines. Cryogenic engines deliver higher specific impulse due to low molecular mass exhaust gases. Ion electric thrusters achieve the highest specific impulse, using electromagnetic fields to accelerate ions to extremely high exhaust velocities.

www.nodia.in

Click Here to Buy book on Amazon

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

# CHAPTER 04
# Electric Current

NODIA

**1.** According to the macroscopic definition of electric current in a solid conductor, which of the following expressions correctly relates the electric current (I) to the drift velocity (vd) of electrons, where n is the number density of free electrons, A is the cross-sectional area, and e is the elementary charge?
(A) I = n A e vd
(B) I = n / (A e vd)
(C) I = (n A e) / vd
(D) I = n A / (e vd)

**2.** Which of the following statements correctly distinguishes Alternating Current (AC) from Direct Current (DC) in standard power transmission?
(A) DC transmission always suffers from higher skin effect losses compared to AC transmission over long distances.
(B) The frequency of standard DC is 50 Hz in India, while AC has zero frequency.
(C) AC can be stepped up or down using a transformer, whereas DC cannot be directly stepped up or down using a standard transformer.
(D) AC power is universally stored in grid-scale lead-acid batteries without requiring rectification.

**3.** Ohm's law states that the current through a conductor is proportional to the voltage across it. Which of the following components exhibits non-ohmic behaviour and does not strictly obey Ohm's law over its entire operating range?
(A) A semiconductor diode
(B) A pure copper wire at constant temperature
(C) A standard carbon resistor
(D) A uniform nichrome wire at constant temperature

**4.** The electrical resistance of a metallic conductor depends on several factors. If a uniform wire of resistance R is stretched to double its original length while maintaining a constant volume, what will be its new resistance?
(A) R / 2
(B) 2R
(C) R / 4
(D) 4R

**5.** Identify the incorrect statement regarding the series and parallel combination of resistors in an electric circuit.
(A) In a series combination, the current flowing through each resistor is the same.
(B) The equivalent resistance of a parallel combination is always greater than the smallest individual resistance in the circuit.
(C) In a parallel combination, the potential difference across each resistor is the same.
(D) The equivalent resistance of a series combination is always greater than the largest individual resistance in the circuit.

**6.** Consider the basic components of an electric circuit. Which of the following represents the correct primary function of a standard electrical fuse?
(A) To regulate the voltage supplied to the circuit
(B) To convert alternating current into direct current for safe appliance operation
(C) To protect the circuit by melting and breaking the connection when excessive current flows
(D) To reduce the overall electrical resistance of the domestic wiring

**7.** An electric motor operates at a voltage of 220 V and draws a current of 5 A. If the motor runs for 2 hours, what is the total electrical energy consumed in kilowatt-hours (kWh)?
(A) 4.4 kWh
(B) 1.1 kWh
(C) 22.0 kWh
(D) 2.2 kWh

**8.** In the context of electricity bill calculations, 1 unit of electricity is fundamentally equivalent to which of the following?
(A) $3.6 \times 10^6$ Joules
(B) 1000 Joules

(C) 3600 Joules
(D) $10^6$ Watts

**9.** Based on the energy band theory of solids, how are insulators fundamentally distinguished from semiconductors?
(A) Insulators have overlapping valence and conduction bands, whereas semiconductors possess a small forbidden energy gap.
(B) Insulators have a very large forbidden energy gap, preventing electron excitation to the conduction band.
(C) Insulators have an empty valence band at absolute zero, whereas semiconductors possess a partially filled band.
(D) Insulators conduct electric current via free protons, whereas semiconductors conduct via electrons and holes.

**10.** Read the following statements and select the correct option.
**Assertion (A):** Oersted's experiment demonstrated that a magnetic compass needle deflects when placed near a wire carrying an electric current.
**Reason (R):** An electric current flowing through a conductor produces a magnetic field in its surrounding space.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**11.** Which of the following fundamental principles primarily governs the operation of a standard DC electric motor?
(A) Magnetic force exerted on a current-carrying conductor in an external field
(B) Generation of electromotive force across a conductor in a changing magnetic flux
(C) Generation of heat due to resistance when electric current flows in a conductor
(D) Chemical decomposition of electrolyte solutions caused by electric current flow

**12.** According to Fleming's Left-Hand Rule, if the forefinger points in the direction of the magnetic field and the middle finger points in the direction of the current, what does the thumb indicate?
(A) The direction of the induced electromotive force generated
(B) The direction of the external magnetic field vector
(C) The direction of motion or force on the conductor
(D) The direction of positive electrical charge migration

**13.** A transformer is used to step up or step down alternating voltage. On which of the following scientific principles does a transformer primarily work?
(A) Self-induction
(B) Thermoelectric emission
(C) Coulomb's inverse square law
(D) Mutual induction

**14.** Which of the following statements regarding the earthing (grounding) of domestic electrical appliances is most appropriate?
(A) Earthing prevents appliances from drawing excess electrical current directly from the neutral supply wire.
(B) Earthing increases overall operating efficiency of appliances by continuously stabilizing the supply voltage.
(C) Earthing provides a low-resistance path for leakage current to ground, preventing electric shock.
(D) Earthing is an operational requirement strictly necessary for electrical appliances using direct current.

**15.** Consider the following statements regarding short circuits and overloading in electrical systems:
I. A short circuit occurs when the live wire and neutral wire come into direct contact due to damaged insulation.
II. Overloading happens when too many high-power appliances are connected to a single socket, drawing current beyond the circuit's rated capacity.
III. An MCB protects a circuit exclusively against short circuits and offers no protection against overloading.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

Downloaded from www.pdf.tube

**16.** The heating effect of electric current, mathematically expressed as $H = I^2$ Rt, is also commonly known as:
(A) Seebeck effect
(B) Peltier effect
(C) Thomson effect
(D) Joule heating

**17.** In the process of electrolysis, what is the term used for the electrode connected to the positive terminal of the battery, where oxidation typically occurs?
(A) Anode
(B) Cathode
(C) Electrolyte
(D) Diode

**18.** Identify the correct pair among the following types of cells and their classification.
(A) Dry cell (Leclanche cell) - Secondary cell
(B) Lead-acid accumulator - Primary cell
(C) Lithium-ion battery - Secondary cell
(D) Daniel cell - Secondary cell

**19.** The National Power Grid in India operates to ensure stable and synchronized electricity transmission. What is the standard nominal frequency of the AC grid in India?
(A) 50 Hz
(B) 60 Hz
(C) 120 Hz
(D) 220 Hz

**20.** Match the power plants in Rajasthan with their corresponding districts.
**List I: Power Plants**
P. Suratgarh Super Thermal Power Station
Q. Chhabra Super Thermal Power Plant
R. Kalisindh Thermal Power Station
S. Ramgarh Gas Thermal Power Station
**List II: Districts**
1. Jhalawar
2. Baran
3. Jaisalmer
4. Sri Ganganagar
(A) P-4, Q-2, R-1, S-3
(B) P-2, Q-4, R-3, S-1
(C) P-4, Q-1, R-2, S-3
(D) P-3, Q-2, R-1, S-4

**21.** Photovoltaic (PV) cells convert solar energy directly into electrical energy. Which semiconductor material is most widely used in the commercial manufacturing of standard solar panels?
(A) Gallium Arsenide
(B) Crystalline Silicon
(C) Cadmium Telluride
(D) Amorphous Carbon

NODIA

**22.** What is the primary functional difference between a Miniature Circuit Breaker (MCB) and an Earth Leakage Circuit Breaker (ELCB) / Residual Current Circuit Breaker (RCCB)?
(A) MCB regulates unexpected line voltage fluctuations, whereas ELCB regulates supply frequency changes.
(B) MCB is used exclusively in high-voltage industrial grids, whereas ELCB is used in solar power plants.
(C) MCB protects against overcurrent, whereas ELCB protects against earth leakage.
(D) MCB operates primarily on the chemical effect of current, whereas ELCB operates on the thermal effect.

**23.** Kirchhoff's Current Law (KCL) states that the algebraic sum of currents meeting at a junction in an electrical circuit is zero. This law is a direct consequence of the principle of conservation of:
(A) Energy
(B) Momentum
(C) Mass
(D) Charge

**24.** For the purpose of electrical energy conservation, the Bureau of Energy Efficiency (BEE) in India provides star ratings to appliances. Which of the following statements is true regarding BEE star ratings?
(A) A 5-star appliance is more energy-efficient than a 3-star appliance of equal capacity.
(B) A higher star rating indicates greater electrical power consumption and reduced overall operating efficiency.
(C) Star ratings apply exclusively to high-capacity industrial machinery rather than household domestic appliances.
(D) The star rating of an electrical appliance is inversely proportional to its total operational lifespan.

**25.** Consider the following features commonly associated with advanced digital electricity metering systems:
I. Two-way communication between the meter and the central system

II. Remote meter reading and automated billing capability
III. Real-time monitoring of energy consumption by the consumer
IV. Inability to integrate with rooftop solar net-metering structures

Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) II, III and IV only
(C) I, II and III only
(D) I, III and IV only

**26.** In the context of the unit of electric current, one Ampere is defined precisely in terms of fundamental constants. Historically, in the SI system before 2019, it was defined based on:
(A) The mass of silver deposited during the electrolysis of silver nitrate in one second.
(B) The force between two infinite parallel current-carrying conductors in a vacuum.
(C) The number of electrons passing through a fixed cross-section per second.
(D) The voltage developed across a standard resistor at absolute zero.

**27.** Identify the odd one out among the following devices based on the type of electric current they primarily supply or output.
(A) Bicycle dynamo
(B) Dry cell battery
(C) Lead-acid accumulator
(D) Solar photovoltaic cell

**28.** Consider the following statements regarding the limitations of Ohm's law:
**Statement I:** Ohm's law fails for semiconductor devices because the relation between V and I is not perfectly linear.
**Statement II:** Ohm's law is a fundamental universal law of physics applicable to all states of matter at all temperature ranges.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**29.** The unit of electrical resistivity (specific resistance) is:
(A) Ohm
(B) Ohm/meter
(C) Mho
(D) Ohm-meter

**30.** Which of the following represents the correct sequence of equivalent resistance when three identical resistors, each of resistance R, are connected in the following configurations?
(A) Series > Parallel > Two in series, one parallel across them
(B) Series > Two in parallel, one in series with them > Parallel
(C) Parallel > Two in parallel, one in series with them > Series
(D) Series > Two in parallel, one in series with them > Two in series, one parallel across them

**31.** Which of the following materials is typically preferred for making the filament of a standard incandescent light bulb, and why?
(A) Copper, due to its very low electrical resistance and high thermal conductivity
(B) Tungsten, due to its high melting point
(C) Nichrome, because it is an alloy that melts easily at moderate operating temperatures
(D) Aluminum, because it is lightweight, inexpensive, and highly conductive to electricity

**32.** If two electric bulbs of 60W and 100W are designed to operate at 220V, which bulb has a higher internal electrical resistance?
(A) The 100W bulb
(B) Both have the same resistance
(C) Resistance cannot be determined from the given data
(D) The 60W bulb

**33.** A household uses four ceiling fans of 50 W each and two tube lights of 40 W each. If all these appliances operate for 10 hours a day, what will be the total energy consumed in a 30-day month?
(A) 84 kWh
(B) 280 kWh
(C) 840 kWh
(D) 28 kWh

**34.** Superconductors are materials that, below a certain critical temperature, exhibit:
(A) Infinite electrical resistance
(B) Extreme semiconductor behaviour
(C) Zero electrical resistance
(D) Complete absorption of external magnetic fields

**35.** Read the following statements and select the correct option.

Click Here to Buy book on Flipkart

**Assertion (A):** Inside a straight, long, current-carrying solenoid, the magnetic field is uniform and parallel to the axis of the solenoid.
**Reason (R):** The magnetic field lines inside a solenoid are closely spaced parallel straight lines, indicating a strong and uniform magnetic field.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**36.** An AC generator differs structurally from a DC generator primarily in the use of:
(A) A permanent magnet instead of an electromagnet
(B) A split-ring commutator instead of slip rings
(C) Carbon brushes instead of metal brushes
(D) Slip rings instead of a split-ring commutator

**37.** Fleming's Right-Hand Rule is fundamentally used to determine the direction of:
(A) Magnetic field around a current-carrying straight conductor
(B) Induced current in a conductor moving through a magnetic field
(C) Force acting on a current-carrying conductor in a magnetic field
(D) Electron flow in a chemical cell

**38.** Identify the incorrect statement concerning the use of transformers in power distribution.
(A) A step-up transformer significantly increases the alternating voltage while proportionally decreasing the alternating current flow.
(B) Transformers operate strictly on the fundamental principle of mutual electromagnetic induction and therefore require alternating current.
(C) A step-down transformer is used at power stations for long-distance transmission.
(D) The iron core of a transformer is constructed with laminated sheets to minimize total energy losses caused by induced eddy currents.

**39.** Which of the following color-coding conventions is standard for electrical wiring in domestic AC circuits in India for Phase (Live), Neutral, and Earth respectively?
(A) Red, Black, Green
(B) Green, Red, Black
(C) Black, Red, Green
(D) Brown, Blue, Green/Yellow

**40.** Consider the following statements regarding the causes of electrical overloading:
I. Connecting too many appliances to a single extension board.
II. Accidental hike in the supply voltage from the distribution grid.
III. Using appliances with very low power ratings on a high-capacity line.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**41.** The chemical effect of electric current is commercially utilized in which of the following industrial processes?
(A) Generating microwaves for heating
(B) Electroplating of metals
(C) Inducing mechanical rotation in electric motors
(D) Measuring high temperatures using pyrometers

**42.** According to Faraday's First Law of Electrolysis, the mass of a substance deposited or liberated at an electrode is directly proportional to:
(A) The average operational temperature maintained within the liquid electrolyte solution
(B) The total electric charge passed through the electrolyte
(C) The overall volume and concentration of the active electrolytic solution present
(D) The physical surface area and structural dimensions of the submerged electrodes

**43.** Consider the following statements about batteries:
**Statement I:** Primary cells can be recharged by passing an electric current through them in the reverse direction.
**Statement II:** Secondary cells, such as lead-acid batteries, rely on reversible chemical reactions for their operation.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

Downloaded from www.pdf.tube

**44.** High voltage is preferred for long-distance power transmission through the national grid primarily because:
(A) High voltage electrical signals travel significantly faster than low voltage signals through copper transmission wires.
(B) High voltage transmission lines eliminate the operational requirement for physical support structures or ceramic insulators.
(C) It reduces transmission current, minimizing $I^2R$ power losses.
(D) It effectively prevents alternating current from undergoing unwanted frequency variations over long transmission distances.

**45.** Arrange the following major power generation projects in Rajasthan in descending order of their installed capacity (highest to lowest):
I. Suratgarh Super Thermal Power Station
II. Ramgarh Gas Thermal Power Station
III. Chhabra Super Thermal Power Project
IV. Mahi Hydel Power Project
Which of the above represents the correct sequence?
(A) I, III, II, IV
(B) I, III, IV, II
(C) III, I, II, IV
(D) III, I, IV, II

**46.** What is the fundamental mechanism by which a solar photovoltaic cell generates electricity when exposed to sunlight?
(A) Solar heat energy absorbed by the panel rapidly boils internal fluids to drive a miniature mechanical turbine.
(B) The cell operates primarily as a thermoelectric generator by utilizing substantial temperature differences between its top and bottom layers.
(C) Photons loosen electrons in the semiconductor, generating current across the P-N junction.
(D) Incidental light energy directly triggers an electrochemical reaction within an internal liquid silicon acid electrolyte solution.

**47.** Which of the following is an incorrect pair of an electrical safety device and its primary operational characteristic?
(A) MCB (Miniature Circuit Breaker) - Automatically trips and interrupts electrical supply during overcurrent or short-circuit events
(B) MCCB - Used only for low-current home appliances
(C) ELCB (Earth Leakage Circuit Breaker) - Operates by continuously detecting potential leakage currents escaping to the earth ground
(D) Fuse wire - Rapidly melts due to intense Joule heating whenever electric current exceeds a predetermined threshold rating

**48.** Kirchhoff's Voltage Law (KVL) is based on the principle of conservation of energy. It states that in any closed electrical loop:
(A) The sum of all resistances is equal to zero.
(B) The total current entering the loop equals the total power consumed.
(C) The voltage drops are always strictly positive regardless of direction.
(D) The algebraic sum of changes in potential must be zero.

**49.** Replacing traditional incandescent bulbs with LED (Light Emitting Diode) lamps is a common energy conservation measure. Why are LEDs more energy-efficient?
(A) LEDs convert more electrical energy to light instead of heat.
(B) LEDs operate on significantly higher electrical voltages, thereby requiring substantially less current flow.
(C) LEDs fundamentally violate Ohm's law, permitting them to draw virtually zero power once fully illuminated.
(D) LEDs incorporate internal miniature transformers that actively generate excess non-dissipative energy.

NODIA

**50.** Consider the following statements regarding the implementation of smart meters and digital electricity metering systems:
I. Smart meters eliminate the need for manual meter reading by utility personnel.
II. They can help in better demand-side management by providing real-time data to consumers and distributors.
III. They operate solely on mechanical gears and analog dials.
IV. They facilitate easier integration of renewable energy sources through net metering.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I, III and IV

**51.** Which of the following does NOT represent a valid unit of electric power?
(A) Ampere-hour
(B) Watt
(C) Volt-Ampere
(D) Joule per second

**52.** If a wire of resistance 10 ohms is cut into two equal halves and these halves are then connected in parallel, what will be the equivalent resistance of the new combination?
(A) 5.0 ohms
(B) 10.0 ohms
(C) 20.0 ohms
(D) 2.5 ohms

**53.** Under the limitations of Ohm's Law, a device whose V-I characteristic curve is a straight line passing through the origin is referred to as:
(A) A non-ohmic device
(B) An ohmic device
(C) A unilateral device
(D) An active device

**54.** The specific resistance (resistivity) of a given metallic wire depends exclusively upon its:
(A) Total geometric length of the conductor
(B) Total cross-sectional area of the conductor
(C) Material and temperature
(D) Physical shape and total mass of the conductor

**55.** Match the physical quantities with their standard SI units.
**List I: Physical Quantities**
P. Electric Potential
Q. Electric Resistance
R. Electric Power
S. Electrical Energy
**List II: Standard SI Units**
1. Joule
2. Watt
3. Volt
4. Ohm
(A) P-3, Q-4, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-3, S-1

**56.** Consider the following statements regarding the basic components of an electric circuit:
**Statement I:** A closed switch provides a path of virtually zero resistance for current to flow.
**Statement II:** A voltmeter is always connected in series with the component across which the potential difference is to be measured.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**57.** The formula used to calculate electric power when the voltage (V) and resistance (R) are known, but current is not directly given, is:
(A) $P = \frac{V^2}{R}$
(B) $P = \frac{V^2}{R}$
(C) $P = V^2 \times R$
(D) $P = \frac{R^2}{V}$

**58.** The billing unit 'kWh' is equivalent to the energy consumed when an appliance of 1000 Watts operates for:
(A) 1 minute
(B) 1 hour
(C) 10 hours
(D) 24 hours

**59.** Identify the correct pair representing a semiconductor material and its typical application.
(A) Germanium - Transistors and diodes
(B) Polystyrene - Switchgear insulation
(C) Nichrome - Connecting wires
(D) Tungsten - Solar panels

**60.** Read the following statements and select the correct option.
**Assertion (A):** The magnetic field strength at the center of a circular current-carrying coil increases if the number of turns in the coil is increased.
**Reason (R):** The magnetic field produced by each turn of the coil adds up because the current in all circular turns flows in the same direction.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

Click Here to Buy book on Amazon

**61.** Which of the following statements regarding the basic working of an electric generator is incorrect?
(A) It directly converts mechanical rotational energy into usable electrical energy.
(B) The magnitude of the induced electromotive force depends directly on the rate of change of magnetic flux.
(C) It relies fundamentally on the principle of electromagnetic induction.
(D) It produces only direct current at its armature prior to commutation.

**62.** According to the Right-Hand Thumb Rule (Maxwell's Corkscrew Rule), if you grasp a straight current-carrying wire with your right hand such that the thumb points in the direction of the current, what do the curled fingers represent?
(A) The direction of the electric field
(B) The direction of the induced electromotive force
(C) The direction of the magnetic field lines
(D) The direction of mechanical force on the wire

**63.** Identify the odd one out in terms of the fundamental principle on which the following electrical devices operate.
(A) Electric iron
(B) Electric bell
(C) Electric toaster
(D) Electric room heater

**64.** When stepping up voltage for long-distance transmission, why does the alternating current (AC) not violate the principle of conservation of energy?
(A) Because the effective electrical resistance of power transmission cables decreases automatically whenever operational voltage increases.
(B) Because magnetic transformers continuously impart kinetic energy to moving electrons to compensate for elevated supply voltage levels.
(C) Because the operating frequency of alternating current is artificially reduced in proportional steps to maintain overall power balance.
(D) Because current decreases proportionally as voltage increases, keeping power constant.

NODIA

**65.** Consider the following statements regarding electrical safety devices:
I. A fuse should always be connected in the live wire of a circuit.
II. Earthing is primarily meant to protect appliances from voltage fluctuations.
III. MCBs work on the magnetic and thermal effects of electric current.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**66.** In a standard lead-acid battery used in vehicles, which chemical solution is used as the electrolyte?
(A) Dilute Hydrochloric acid
(B) Concentrated Nitric acid
(C) Dilute Sulfuric acid
(D) Potassium Hydroxide solution

**67.** Consider the following statements about electrolysis:
**Statement I:** Pure water is an excellent conductor of electricity and readily undergoes electrolysis without any additives.
**Statement II:** Adding a small amount of acid or base to water increases its conductivity, facilitating the electrolytic breakdown into hydrogen and oxygen.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**68.** The primary distinction between a primary cell and a secondary cell is that:
(A) Primary cells produce AC, whereas secondary cells produce DC.
(B) Primary cells have a liquid electrolyte, whereas secondary cells always have a solid electrolyte.
(C) Primary cells use solar energy, whereas secondary cells use chemical energy.
(D) Primary cells cannot be recharged after use, whereas secondary cells are rechargeable.

**69.** Which organization is responsible for the overall supervision, control, and maintenance of the inter-state transmission system and the operation of the National Grid in India?
(A) Rural Electrification Corporation (REC)
(B) Power Grid Corporation of India Limited

(POWERGRID)
(C) Bureau of Energy Efficiency (BEE)
(D) Solar Energy Corporation of India (SECI)

**70.** Which of the following represents the correct hierarchical sequence of electrical power distribution companies (DISCOMs) in Rajasthan based on their geographical jurisdiction (Jaipur, Jodhpur, Ajmer)?
(A) JVVNL manages electricity distribution in western Rajasthan, JdVVNL manages eastern regions, and AWVNL manages northern territories.
(B) JdVVNL comprehensively covers the entire state network, whereas JVVNL and AWVNL manage designated urban municipal centers exclusively.
(C) JVVNL handles eastern, JdVVNL handles western, and AWVNL handles central/ southern Rajasthan.
(D) AWVNL focuses strictly on regional electrical power generation, whereas JVVNL and JdVVNL operate high-voltage transmission lines exclusively.

**71.** The world's largest solar park (by capacity), located in Rajasthan and playing a crucial role in India's renewable energy targets, is:
(A) Charanka Solar Park
(B) Pavagada Solar Park
(C) Kurnool Ultra Mega Solar Park
(D) Bhadla Solar Park

**72.** An MCCB (Molded Case Circuit Breaker) is generally preferred over an MCB (Miniature Circuit Breaker) in which of the following scenarios?
(A) For high-current industrial applications with adjustable trip settings.
(B) For standard domestic household lighting circuits that demand overload protection operating well below 10 Amps capacity.
(C) For sensitive detection of extremely low earth leakage fault currents in residential bathroom and kitchen appliances.
(D) For strictly rectifying and converting heavy alternating current into direct current within large manufacturing factory settings.

**73.** Which of the following statements about Kirchhoff's laws is incorrect?
(A) KCL is applicable to any node or junction in a circuit.
(B) KVL is based on the principle of conservation of momentum of electrons.
(C) KVL states that the algebraic sum of all potential drops and EMFs in any closed loop is zero.
(D) KCL implies that charge cannot accumulate at a node in a steady-state circuit.

**74.** Which of the following is NOT an effective measure for electrical energy conservation in a domestic household?
(A) Maximizing the use of natural sunlight during the day.
(B) Leaving appliances in standby mode rather than turning them off completely.
(C) Using appliances with higher Bureau of Energy Efficiency (BEE) star ratings.
(D) Replacing traditional electric water heaters with solar water heaters.

**75.** Consider the following statements about digital electricity metering systems:
I. Digital meters use solid-state electronics to measure power consumption accurately.
II. They have moving disks that rotate proportionally to the power drawn.
III. Smart digital meters can communicate consumption data remotely via GSM/RF networks.
IV. They are highly resistant to magnetic tampering compared to older electromechanical meters.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) II, III and IV
(D) I, II, III and IV

**76.** The resistance of a conductor is inversely proportional to its:
(A) Length
(B) Temperature
(C) Cross-sectional area
(D) Resistivity

**77.** In India, the standard domestic AC power supply is characterized by a voltage and frequency of approximately:
(A) 110 V, 60 Hz
(B) 220 V, 60 Hz
(C) 110 V, 50 Hz
(D) 220 V, 50 Hz

**78.** Consider the following statements about Ohm's law:

Downloaded from www.pdf.tube

**Statement I:** Ohm's law holds true only if the physical conditions, such as the temperature of the conductor, remain constant.
**Statement II:** The V-I graph for an ohmic conductor at a constant temperature is a parabola.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**79.** The most appropriate reason for connecting domestic electrical appliances in a parallel configuration rather than a series configuration is:
(A) To systematically elevate the total effective electrical resistance across the entire domestic household circuit network.
(B) To allow each appliance to operate independently if another fails.
(C) To significantly minimize the physical volume and total weight of copper wiring required during standard residential house wiring.
(D) To guarantee that all connected household appliances draw identical values of electrical current regardless of individual power ratings.

**80.** Match the types of materials with their electrical behavior.
**List I: Materials**
P. Copper
Q. Glass
R. Silicon
S. Superconductor (below Tc)
**List II: Electrical Behavior**
1. Infinite conductivity / Zero resistance
2. Good electrical conductor
3. Electrical insulator
4. Semiconductor
(A) P-2, Q-3, R-4, S-1
(B) P-2, Q-4, R-3, S-1
(C) P-1, Q-3, R-4, S-2
(D) P-4, Q-3, R-2, S-1

**81.** Which of the following is an incorrect pair regarding the basic components of an electric circuit and their circuit symbols?
(A) Cell - Two parallel lines of equal length
(B) Ammeter - A circle with 'A' and polarity marks
(C) Variable Resistor (Rheostat) - A zig-zag line with an arrow across it
(D) Switch (Open) - A break in the line or brackets without a dot

**82.** If the current flowing through a fixed resistor is doubled, the electrical power dissipated by the resistor becomes:
(A) Two times its original value
(B) Half its original value
(C) Four times its original value
(D) Unchanged

**83.** Identify the odd one out based on the principle of operation of the devices.
(A) Electric generator
(B) Electric toaster
(C) Electric geyser
(D) Electric fuse

**84.** When the temperature of a pure semiconductor (like intrinsic silicon) increases, its electrical resistance generally:
(A) Increases linearly
(B) Remains completely unchanged
(C) Increases initially and then decreases
(D) Decreases

**85.** Read the following statements and select the correct option.
**Assertion (A):** Two parallel wires carrying electric currents in the same direction attract each other.
**Reason (R):** The magnetic field produced by one wire exerts a Lorentz force on the moving charges in the second wire, directed towards the first wire.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**86.** The core of an electromagnet is ideally made of:
(A) Steel
(B) Copper
(C) Soft iron
(D) Aluminum

**87.** Which of the following statements about Fleming's left-hand rule is incorrect?
(A) It is primarily used to find the direction of force on a current-carrying conductor in a

NODIA

magnetic field.
(B) The rule relies on the current, magnetic field, and force being mutually perpendicular.
(C) It is the underlying principle for the operation of electric motors.
(D) The middle finger represents the direction of the magnetic field.

**88.** In an ideal transformer, if the number of turns in the secondary coil is greater than the number of turns in the primary coil, it acts as a:
(A) Step-up transformer
(B) Step-down transformer
(C) Rectifier
(D) Voltage stabilizer

**89.** Consider the following statements about electrical safety:
**Statement I:** The earth wire is usually connected to the metallic body of heavy appliances like refrigerators.
**Statement II:** Connecting the earth wire prevents the appliance's body from attaining a dangerous high potential if the live wire accidentally touches it.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**90.** Consider the following factors that could lead to a short circuit in domestic wiring:
I. Deterioration of wire insulation due to aging and excessive heat.
II. Connecting a high-power rated appliance to a circuit with adequate capacity.
III. Physical damage to cables causing the live and neutral wires to touch.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**91.** The magnetic effect of electric current was first discovered by:
(A) Hans Christian Oersted
(B) Michael Faraday
(C) James Clerk Maxwell
(D) Heinrich Hertz

**92.** A current of 2 Amperes is passed through a copper sulfate ($CuSO_4$) solution for 30 minutes. Which law provides the mathematical basis for calculating the exact mass of copper deposited on the cathode?
(A) Newton's Law of Cooling
(B) Joule's Law of Heating
(C) Faraday's First Law of Electrolysis
(D) Kirchhoff's Current Law

**93.** Which of the following statements correctly describes a characteristic of secondary cells (e.g., Lithium-ion batteries)?
(A) They cannot be reused once their chemical energy is exhausted.
(B) They are exclusively used in large industrial setups and never in portable electronics.
(C) They generate alternating current directly without an inverter.
(D) Their electrochemical reactions are highly reversible, allowing them to be recharged.

**94.** The primary function of a substation in a power transmission network is to:
(A) Generate power continuously on a municipal scale using industrial diesel generator sets.
(B) Convert all incoming alternating current into direct current for efficient long-distance transport.
(C) Step voltage levels using transformers for transmission or distribution.
(D) Measure and record the daily electrical power consumption metrics of individual residential household units.

**95.** Arrange the following stages of electrical power supply from generation to domestic use in the correct logical sequence:
I. Generation at a Power Plant (e.g., 11 kV)
II. Stepping down voltage at local distribution substation (e.g., 11 kV to 220 V)
III. Stepping up voltage for transmission (e.g., to 220 kV or 400 kV)
IV. Transmission over high-voltage long-distance grid lines
Which of the above represents the correct sequence?
(A) I, III, IV, II
(B) I, II, III, IV
(C) III, I, IV, II
(D) I, IV, III, II

**96.** Under the PM-KUSUM scheme widely implemented in Rajasthan, solar power technology is primarily being utilized for:
(A) Powering electric locomotive engines across

Click Here to Buy book on Flipkart

urban underground metro train transit networks.
(B) Running centralized air conditioning and environmental climate control systems in all government administrative buildings.
(C) Powering commercial domestic passenger flights operating on regional routes within the geographical boundaries of the state.
(D) Solarizing agricultural pumps and providing grid-connected solar power to farmers.

**97.** Consider the following statements about Residual Current Circuit Breakers (RCCB) / ELCB:
**Statement I:** An RCCB continuously compares the current flowing in the live wire with the current returning in the neutral wire.
**Statement II:** If a person touches a live wire, creating a leakage path to the ground, the RCCB detects the current imbalance and trips the circuit.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**98.** In solving complex electrical circuits using Kirchhoff's laws, if the assumed direction of current in a loop analysis turns out to be opposite to the actual current flow, the calculated value of that current will be:
(A) Zero
(B) Positive
(C) Negative
(D) Infinity

**99.** Which of the following is the most appropriate long-term measure for energy conservation in a highly illuminated industrial workspace?
(A) Installing motion sensors and daylight harvesting for LED lighting.
(B) Painting all interior workspace walls in dark black tones to naturally absorb excess ambient light reflection.
(C) Operating traditional incandescent light bulbs at a slightly reduced voltage level during peak working hours.
(D) Replacing all standard luminaire light fixtures throughout the facility with high-power halogen illumination lamps.

**100.** Consider the following statements regarding Smart Meters in Rajasthan:
I. They facilitate prepaid metering, allowing consumers to pay for electricity before use.
II. They completely eliminate transmission and distribution (T&D) line losses.
III. They help Discoms pinpoint localized outages more rapidly.
IV. They provide consumer dashboards via mobile apps for energy usage tracking.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I, II and IV

**101.** Consider the following statements regarding the flow of electric charge:
**Statement I:** In a solid metallic conductor, the electric current is constituted entirely by the flow of positively charged protons.
**Statement II:** By convention, the direction of electric current is taken as opposite to the direction of the flow of electrons.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

NODIA

**102.** The RMS (Root Mean Square) value of a standard alternating voltage is related to its peak value (V0) by which of the following relations?
(A) $V_{\text{rms}} = \frac{V_0}{2}$
(B) $V_{\text{rms}} = V_0 \times 2$
(C) $V_{\text{rms}} = \frac{V_0}{2}$
(D) $V_{\text{rms}} = V_0 \times 2$

**103.** Which of the following is an incorrect statement regarding Ohm's Law?
(A) It precisely defines the proportional relationship existing between applied potential difference and electric current.
(B) The mathematical ratio V/I remains strictly constant and is defined as resistance for any linear ohmic conductor.
(C) Significant ambient temperature variations can readily induce measurable deviations from Ohm's Law in metallic conductors.
(D) It holds true for non-linear components like vacuum tubes and transistors.

**104.** A copper wire has a resistance of 10 ohms. If its length is doubled and its radius is halved, what

will be its new resistance? (Assuming constant resistivity)
(A) 80 ohms
(B) 20 ohms
(C) 40 ohms
(D) 10 ohms

**105.** Match the electrical components with their primary functions.
**List I: Electrical Components**
P. Galvanometer
Q. Capacitor
R. Resistor
S. Rectifier
**List II: Primary Functions**
1. Opposes the flow of electric current
2. Converts AC to DC
3. Detects small electric currents
4. Stores electrical charge
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-4, R-2, S-1
(D) P-1, Q-2, R-3, S-4

**106.** In domestic circuit wiring, switches are fundamentally designed to be connected in series with the:
(A) Earth wire
(B) Live (Phase) wire
(C) Neutral wire
(D) Either Neutral or Earth wire

**107.** Which of the following statements is correct regarding the calculation of electric energy consumed?
(A) Energy (E) = Power (P) × Time (t)
(B) Energy (E) = Current (I) × Voltage (V)
(C) Energy (E) = Power (P) / Time (t)
(D) Energy (E) = Voltage (V) × Resistance (R)

**108.** Which of the following appliances is LEAST likely to account for the major portion of electricity bill in a typical domestic household if all are used for 1 hour daily?
(A) 1.5 Ton Air Conditioner
(B) 2000 W Geyser
(C) 10 W LED Bulb
(D) 1500 W Electric Iron

**109.** Which among the following best explains why semiconductors are extensively used in modern electronics instead of pure conductors?
(A) Semiconductors naturally exhibit zero electrical resistance under ordinary room temperature operational conditions.
(B) They possess high physical malleability and can easily be drawn into extremely thin power transmission wires.
(C) They do not obey standard Kirchhoff's circuit laws, thereby greatly simplifying overall electronic circuit designs.
(D) Their conductivity can be precisely controlled by doping and voltage.

**110.** Read the following statements and select the correct option.
**Assertion (A):** Soft iron is preferred over hard steel for making the cores of transformers and electromagnets.
**Reason (R):** Soft iron has low retentivity and low coercive force, leading to minimal hysteresis loss during magnetization and demagnetization cycles.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**111.** In an electric generator, the arrangement of slip rings is associated with which type of output?
(A) Pulsating Direct Current
(B) Alternating Current
(C) Pure Direct Current
(D) Static Electricity

**112.** Consider the following statements about magnetic fields:
**Statement I:** The magnetic field lines around a straight current-carrying conductor are concentric circles.
**Statement II:** According to Maxwell's Right-Hand Grip Rule, reversing the direction of current reverses the direction of the magnetic field lines.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

NODIA

**113.** A transformer cannot be used to step up a DC voltage. The fundamental conceptual reason for this is:
(A) Steady DC produces no changing magnetic

flux to induce voltage.
(B) Direct currents flowing in primary windings are inherently too large for thin electrical copper wires in transformers.
(C) Direct current voltage supplies strictly violate fundamental principles of thermal energy conservation within magnetic cores.
(D) The solid laminated iron core of a power transformer will melt almost instantly whenever direct current is continuously applied.

**114.** The rating of an electric fuse is usually expressed in terms of:
(A) Volts
(B) Watts
(C) Amperes
(D) Joules

**115.** Consider the following statements regarding electrical safety mechanisms:
I. A fuse wire must have a high melting point to withstand large currents.
II. Miniature Circuit Breakers (MCBs) can be manually reset after they trip, unlike traditional fuses which must be replaced.
III. Short-circuiting often results in a dangerously high current due to a sudden drop in the circuit's total resistance.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**116.** When an electric current passes through a liquid capable of conducting electricity, causing chemical decomposition, the liquid is called:
(A) An insulator
(B) A dielectric
(C) A semiconductor
(D) An electrolyte

**117.** Identify the odd one out from the following list of cell types.
(A) Zinc-Carbon dry cell
(B) Lead-acid accumulator
(C) Alkaline cell
(D) Mercury button cell

**118.** Which of the following represents the correct sequence of grid integration voltage levels (from lowest to highest) typically found in the Indian power transmission system?
(A) 220 kV → 132 kV → 33 kV → 11 kV
(B) 11 kV → 33 kV → 132 kV → 220 kV
(C) 33 kV → 11 kV → 220 kV → 132 kV
(D) 132 kV → 33 kV → 220 kV → 11 kV

**119.** Rajasthan Rajya Vidyut Utpadan Nigam Limited (RRVUNL) is structurally responsible primarily for which aspect of the state's power sector?
(A) Collecting monthly electricity bills directly from individual domestic residential consumers.
(B) Formulating comprehensive national electricity policy guidelines for the central government.
(C) Manufacturing advanced digital smart meters for private regional distribution utility franchises.
(D) Operating state-owned thermal, hydel, and gas power stations.

**120.** Match the renewable energy initiatives/plants in Rajasthan with their primary associated technology.
**List I: Initiatives/Plants**
P. Bhadla Park
Q. PM-KUSUM Component B
R. Rawatbhata
S. Jaisalmer/Akal region installations
**List II: Primary Associated Technology**
1. Wind Energy
2. Nuclear Energy
3. Off-grid Solar Water Pumps
4. Mega Solar Photovoltaic Park
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-3, R-4, S-1

**121.** To maximize the energy output from a static flat-plate solar photovoltaic panel located in Rajasthan, in which direction should the panel primarily face?
(A) North
(B) South
(C) East
(D) West

**122.** Which safety device is specifically designed to detect very small unbalanced currents (e.g., 30 mA) caused by current leaking to ground through a person's body, thus preventing fatal electric shocks?
(A) MCCB

Downloaded from www.pdf.tube

(B) RCCB / ELCB
(C) Standard HRC Fuse
(D) Voltage Stabilizer

**123.** Which of the following is an incorrect pair concerning Kirchhoff's laws and their underlying conservation principles?
(A) KVL - Sum of all currents in a closed loop is always strictly zero
(B) Node Law (KCL) - Conservation of Charge
(C) Loop Law (KVL) - Conservation of Energy
(D) KCL - Sum of currents entering a node equals sum of currents leaving

**124.** The implementation of "Time of Day" (ToD) or "Time of Use" (ToU) metering using smart meters aims to encourage consumers to:
(A) Consume maximum possible electrical power during periods of peak grid demand hours.
(B) Entirely cease using major residential electrical appliances during standard daytime operating hours.
(C) Shift flexible loads to off-peak hours to balance grid demand.
(D) Illegally bypass the electricity metering apparatus during specified high-tariff billing hours.

**125.** Consider the following statements about energy-efficient appliances:
I. Inverter-technology air conditioners consume less power because their compressors run at variable speeds rather than constantly turning on and off.
II. BLDC (Brushless Direct Current) fans are significantly more energy-efficient than traditional induction motor ceiling fans.
III. The Bureau of Energy Efficiency (BEE) operates under the Ministry of Power, Government of India.
IV. Energy-efficient appliances usually have a very short lifespan compared to standard appliances due to delicate electronics.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, III and IV
(C) I, II and III
(D) II, III and IV

**126.** A current of 1 A is drawn by a filament of an electric bulb for 10 minutes. The amount of electric charge that flows through the circuit is:
(A) 10 Coulombs
(B) 100 Coulombs
(C) 600 Coulombs
(D) 60 Coulombs

**127.** The power factor of an AC circuit is defined as the cosine of the phase angle between voltage and current. For a purely resistive AC circuit, the power factor is:
(A) Zero
(B) One (Unity)
(C) 0.5
(D) Infinity

**128.** Arrange the following materials in the correct sequence from highest electrical conductivity to lowest electrical conductivity at room temperature:
I. Copper
II. Silver
III. Aluminum
IV. Tungsten
Which of the above represents the correct sequence?
(A) II, I, III, IV
(B) I, II, III, IV
(C) II, III, I, IV
(D) I, III, II, IV

NODIA

**129.** If the voltage across a resistor is increased by 100% while its resistance remains constant, the power dissipated will:
(A) Increase by 300%
(B) Increase by 100%
(C) Increase by 200%
(D) Increase by 400%

**130.** Read the following statements and select the correct option.
**Assertion (A):** High tension (HT) wires used for grid transmission are left without thick rubber insulation.
**Reason (R):** Air itself acts as a sufficient insulator, and keeping wires bare reduces their weight and cost, while structural height prevents accidental human contact.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**131.** When a soft iron bar is placed inside a current-carrying solenoid, the magnetic field inside the solenoid:
(A) Increases significantly
(B) Decreases slightly due to internal magnetic demagnetization effects
(C) Becomes precisely zero due to opposing induced magnetic flux fields
(D) Remains completely unchanged regardless of the iron core insertion

**132.** Consider the following statements about the mechanical aspects of electrical machines:
**Statement I:** The commutator in a DC motor periodically reverses the direction of current in the armature coil to ensure continuous unidirectional rotation.
**Statement II:** The brushes in an electric motor are typically made of carbon to provide a sliding electrical contact with the commutator.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**133.** According to the principle of electromagnetic induction, the magnitude of induced EMF in a coil does NOT depend directly on:
(A) The total number of turns contained within the coil winding
(B) Internal resistance of the coil wire
(C) The precise rate of change of magnetic flux passing through
(D) The overall strength of the surrounding external magnetic field

**134.** Which of the following correctly describes the main purpose of standardizing the three-pin plug in domestic applications?
(A) To provide two separate internal pathways for electric current in order to effectively double the total power output.
(B) To safely allow both alternating current (AC) and direct current (DC) appliances to connect to the exact same wall socket.
(C) The top pin connects earth first and disconnects last for safety.
(D) The three individual pins correspond directly to three distinctly different operating voltage supply levels (220V, 110V, and 5V).

**135.** Consider the following statements about electrolysis and electroplating:
I. The object to be electroplated is made the cathode in the electrolytic cell.
II. The metal to be deposited on the object is made the anode.
III. The electrolyte must contain ions of the metal that is to be deposited.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**136.** In the context of batteries, what does the term 'Ah' (Ampere-hour) primarily specify?
(A) The charge capacity of the battery
(B) The total internal electrical resistance of the battery cells
(C) The maximum steady-state terminal voltage the battery supplies
(D) The continuous rate at which the chemical battery discharges power

**137.** Consider the following statements regarding the structure of power distribution in Rajasthan:
**Statement I:** The state is divided into multiple Distribution Companies (Discoms) to manage regional distribution efficiently.
**Statement II:** RVPNL (Rajasthan Rajya Vidyut Prasaran Nigam Limited) is responsible for power generation, while RRVUNL handles inter-state transmission.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

**138.** Consider the following statements regarding electrical protective devices:
I. ELCBs operate on the principle of detecting a voltage difference between the earth and the equipment body.
II. RCCBs operate on the principle of detecting a current imbalance between phase and neutral.
III. MCBs have a bimetallic strip that bends upon heating to provide overload protection.
IV. An electrical fuse provides superior protection against minor earth leakages compared to an RCCB.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV

Click Here to Buy book on Amazon

(D) I, II and IV

**139.** A node in an electrical circuit is defined as:
(A) A point where two or more circuit elements are connected together.
(B) Any point where an electrical component is grounded.
(C) A closed path where current can circulate without interruption.
(D) The positive terminal of the main power supply.

**140.** Using energy-efficient appliances directly results in:
(A) A substantial overall increase in the base operational load managed by the national power grid.
(B) Significantly higher lifetime carbon footprints resulting from complex industrial manufacturing processes.
(C) Lower electricity consumption and reduced greenhouse gas emissions.
(D) A noticeable degradation of power factors across all branch lines in the domestic residential circuit.

NODIA

www.nodia.in

# ANSWERS

**1.** (A) I = n A e vd
Electric current in a conductor is defined as the total charge flowing across a cross-section per unit time. When a potential difference is applied across a solid metallic conductor, free electrons drift with an average drift velocity. Multiplying charge carrier density, cross-sectional area, elementary charge, and drift velocity yields the macroscopic electric current relationship.

**2.** (C) AC can be stepped up or down using a transformer, whereas DC cannot be directly stepped up or down using a standard transformer. Alternating current periodically reverses direction, creating a continuously changing magnetic flux necessary for operation in transformers. This flux variation enables voltage transformation to high levels for long-distance power transmission and subsequent reduction for consumer safety. Direct current maintains a constant magnetic flux in transformer windings, which prevents electromagnetic induction from stepping up or down voltage.

**3.** (A) A semiconductor diode
Ohmic conductors maintain a constant ratio between voltage and current across their operating range under uniform physical conditions. Semiconductor diodes exhibit non-linear current-voltage characteristics due to potential barriers across p-n junctions. Current flows easily only when forward-biased beyond threshold voltage, causing severe deviations from linear ohmic behavior that render Ohm's law inapplicable over its complete operational range.

**4.** (D) 4R
Electrical resistance varies directly with length and inversely with cross-sectional area. When a uniform wire is stretched to double its original length, its volume remains conserved, forcing the cross-sectional area to decrease to half its initial value. Because resistance depends on the square of length under constant volume conditions, doubling the length quadruples the overall resistance value.

**5.** (B) The equivalent resistance of a parallel combination is always greater than the smallest individual resistance in the circuit.
In a parallel circuit network, electric current divides among multiple parallel branches while maintaining an identical potential difference across every branch element. The reciprocal of equivalent resistance equals the sum of reciprocals of individual resistances. Consequently, parallel combination reduces overall circuit opposition, resulting in an equivalent resistance that is always smaller than the smallest individual resistance present.

**6.** (C) To protect the circuit by melting and breaking the connection when excessive current flows
An electrical fuse serves as a safety device in electrical systems to protect appliances from overcurrent damage. It consists of a thin metallic wire made from a material with a low melting point. When excessive electrical current flows through the circuit, Joule heating causes the fuse wire to melt rapidly, permanently opening the electrical connection.

**7.** (D) 2.2 kWh
Power output equals the product of operating voltage and current flow, giving 1100 Watts or 1.1 kilowatts for a 220 volt and 5 ampere specification. Electrical energy consumption equals power in kilowatts multiplied by operating time in hours. Multiplying 1.1 kilowatts by 2 hours yields 2.2 kilowatt-hours of total electrical energy consumed.

**8.** (A) $3.6 \times 10^6$ Joules
One commercial unit of electrical energy corresponds directly to one kilowatt-hour of electricity consumption. By definition, one kilowatt equals one thousand Watts and one hour equals three thousand six hundred seconds. Multiplying one thousand Joules per second by three thousand six hundred seconds yields 3.6 times 10 to the power 6 Joules of energy.

Downloaded from www.pdf.tube

**9.** (B) Insulators have a very large forbidden energy gap, preventing electron excitation to the conduction band.
In solid-state physics, energy band theory categorizes solids based on the bandgap separating valence and conduction bands. Insulators possess a broad forbidden energy gap exceeding several electron volts, preventing valence electrons from jumping into the conduction band under thermal agitation. Semiconductors feature a narrow gap, enabling thermal excitation of charge carriers.

**10.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Oersted demonstrated that electric currents generate surrounding magnetic fields. When a current flows through a wire, the generated field exerts a magnetic torque on a nearby compass needle, causing physical deflection. The direct cause of the needle movement is the magnetic field produced by moving electric charges, making the reasoning a complete explanation.

**11.** (A) Magnetic force exerted on a current-carrying conductor in an external field
A direct current electric motor converts electrical energy into mechanical rotational motion. When a rectangular coil carrying direct current is positioned inside a stationary magnetic field, magnetic forces act on opposite sides of the loop according to Lorentz force principles. These equal and opposite forces create a mechanical torque that rotates the armature.

**12.** (C) The direction of motion or force on the conductor
Fleming's Left-Hand Rule determines the direction of mechanical force experienced by a current-carrying conductor in a magnetic field. Extending the thumb, forefinger, and middle finger mutually perpendicular to one another aligns the forefinger with the magnetic field and middle finger with electric current, causing the extended thumb to indicate conductor motion.

**13.** (D) Mutual induction
Transformers alter alternating potential difference levels without direct electrical connection between primary and secondary circuits. Alternating current flowing through primary windings generates time-varying magnetic flux inside a shared iron core. This changing flux continuously links with secondary coil turns, inducing an electromotive force across them through the physical mechanism of mutual electromagnetic induction.

**14.** (C) Earthing provides a low-resistance path for leakage current to ground, preventing electric shock.
Earthing connects the metallic enclosure of electrical appliances directly to earth using a low-resistance conductor. If insulation degrades and a live wire touches the metal casing, stray fault current passes safely into the earth. This rapid flow trips protective circuit breakers or melts fuses, safeguarding human operators from severe electric shocks.

NODIA

**15.** (A) I and II only
A short circuit occurs when live and neutral wires touch directly due to insulation failure, dramatically lowering circuit resistance. Overloading occurs when excessive high-power appliances connected to a circuit draw current beyond rated capacity. Miniature circuit breakers provide comprehensive electrical protection against both short-circuit and overload conditions via magnetic and thermal mechanisms.

**16.** (D) Joule heating
When electric current passes through a resistive conductor, electrical energy transforms into thermal energy due to inelastic collisions between charge carriers and lattice ions. The generated thermal heat is directly proportional to resistance, square of current, and operating time duration, a physical fundamental law commonly termed Joule heating or ohmic heating.

**17.** (A) Anode
In electrolytic cells, the electrode connected to the positive battery terminal is termed the anode. Negative ions migrate toward this positive electrode to surrender excess electrons through oxidation reactions. Conversely, the negative electrode is called the cathode, where positive ions gain electrons through reduction processes during active electrolytic chemical decomposition reactions.

**18.** (C) Lithium-ion battery - Secondary cell
Secondary cells are rechargeable electrochemical energy storage devices that utilize reversible chemical reactions. Lithium-ion batteries can be recharged repeatedly by applying an external electric current that reverses internal chemical

reactions. Primary cells, such as Leclanche dry cells and Daniel cells, rely on non-reversible chemical reactions and cannot be recharged once exhausted.

**19.** (A) 50 Hz
The Indian power sector operates on a standardized alternating current frequency across the entire National Grid. A nominal frequency of 50 Hertz indicates that alternating current alters its flow direction fifty full cycles per second. Maintaining frequency within narrow operational limits is critical for synchronized grid stability and efficient operation of connected equipment.

**20.** (A) P-4, Q-2, R-1, S-3
Thermal and gas power stations in Rajasthan are situated across specific districts to optimize resource supply and power distribution. Suratgarh Super Thermal Power Station is located in Sri Ganganagar, Chhabra Super Thermal Power Plant operates in Baran, Kalisindh Thermal Power Station resides in Jhalawar, and Ramgarh Gas Thermal Power Station serves Jaisalmer district.

**21.** (B) Crystalline Silicon
Crystalline silicon represents the primary semiconductor material utilized in commercial photovoltaic technology due to its widespread elemental abundance, highly stable atomic structure, and optimal bandgap energy. It efficiently absorbs sunlight to generate electron-hole charge carriers, facilitating continuous electrical power generation across residential, commercial, and utility-scale solar installations constructed worldwide today.

**22.** (C) MCB protects against overcurrent, whereas ELCB protects against earth leakage.
Miniature Circuit Breakers operate to disconnect power when electric current exceeds rated thresholds due to overloads or short circuits. Earth Leakage Circuit Breakers and Residual Current Circuit Breakers specifically detect tiny residual current imbalances leaking toward ground. This specialized fault detection neutralizes electric shock hazards to protect human lives from dangerous enclosure leakage.

**23.** (D) Charge
Kirchhoff's Current Law states that the algebraic sum of electric currents entering any junction in a circuit equals zero. Because electric current represents the flow rate of charge per unit time, electric charge cannot accumulate or disappear at a node under steady-state conditions, reflecting fundamental law of conservation of electric charge.

**24.** (A) A 5-star appliance is more energy-efficient than a 3-star appliance of equal capacity.
The Bureau of Energy Efficiency provides star labeling to inform consumers about the operational efficiency of electrical appliances. A higher star rating signifies lower electrical power consumption for identical operational output, enabling enhanced energy savings. A five-star rated appliance consumes significantly less energy than a three-star rated appliance of equal operational capacity.

**25.** (C) I, II and III only
Advanced digital metering systems incorporate two-way electronic communication capabilities between utility companies and consumers. They facilitate automated remote meter readings, eliminate manual errors, enable real-time consumption monitoring via digital displays, and seamlessly integrate bidirectional net-metering functionality for consumer rooftop solar photovoltaic installations, thereby rendering statements one, two, and three fully correct.

**26.** (B) The force between two infinite parallel current-carrying conductors in a vacuum.
Prior to the 2019 SI unit redefinition, one Ampere was defined electrodynamically using magnetic force between conductors. It was specified as the constant electric current which, if maintained in two straight parallel conductors of infinite length and negligible circular cross-section placed one meter apart in vacuum, produces two times 10 to seventh Newton per meter force.

**27.** (A) Bicycle dynamo
A bicycle dynamo generates alternating current through electromagnetic induction when its internal rotor spins relative to permanent magnets. In contrast, dry cell batteries, lead-acid accumulators, and solar photovoltaic cells supply direct current characterized by unidirectional electron flow. Therefore, the dynamo differs fundamentally from the other listed electrochemical and photovoltaic direct current sources.

Click Here to Buy book on Flipkart

**28.** (C) Statement I is true but Statement II is false.
Ohm's law is an empirical relation rather than a universal physical law. It fails for non-ohmic devices like semiconductor diodes and transistors where current-voltage relationships are non-linear. Furthermore, metallic conductors deviate from Ohm's law when temperature varies, proving that it is not universally applicable across all physical states and temperature ranges.

**29.** (D) Ohm-meter
Electrical resistivity measures a material's intrinsic opposition to electric current flow. Derived from resistance formula R equals resistivity times length divided by cross-sectional area, resistivity equals resistance multiplied by area divided by length. Substituting Ohms for resistance, square meters for area, and meters for length yields the standard SI unit Ohm-meter.

**30.** (B) Series > Two in parallel, one in series with them > Parallel
For three identical resistors of value R, series connection gives maximum equivalent resistance 3R. Connecting two in parallel yields R/2, which added in series with the third gives 1.5R. Parallel connection of all three gives minimum equivalent resistance R/3. Thus, the descending magnitude order is series, mixed combination, and parallel.

**31.** (B) Tungsten, due to its high melting point
Tungsten is preferred for incandescent light bulb filaments due to its exceptionally high melting point around 3422 degrees Celsius and high resistivity. It can be heated to glowing white incandescence without melting or evaporating rapidly. This thermal stability ensures efficient light emission and reasonable operational lifespan inside evacuated or gas-filled glass bulbs.

**32.** (D) The 60W bulb
Electrical power rating at constant voltage is given by P equals square of V divided by R. This indicates that resistance is inversely proportional to rated power. Therefore, for bulbs designed for the same voltage supply, lower wattage corresponds to higher internal electrical resistance, making the 60 Watt bulb higher in resistance than 100 Watt.

**33.** (A) 84 kWh
Four 50 Watt fans consume 200 Watts, and two 40 Watt tube lights consume 80 Watts, totaling 280 Watts or 0.28 kilowatts. Operating for 10 hours daily gives 2.8 kilowatt-hours per day. Over a 30-day month, total consumption equals 2.8 multiplied by 30, resulting in 84 kilowatt-hours of electrical energy consumed.

**34.** (C) Zero electrical resistance
Superconductivity is a physical phenomenon observed in specific materials cooled below a characteristic critical temperature. In this state, electrical resistance drops abruptly to absolute zero, allowing electric current to flow continuously without energy dissipation as heat. Additionally, superconductors exhibit perfect diamagnetism by expelling magnetic flux fields through the Meissner effect.

**35.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Inside a long helical current-carrying solenoid, magnetic fields produced by individual turns superimpose constructively. Field lines inside form closely spaced, uniform parallel straight lines running parallel to the central axis, establishing a strong and uniform magnetic field throughout the interior volume, making the Reason a valid and complete physical explanation for the Assertion.

**36.** (D) Slip rings instead of a split-ring commutator
An alternating current generator uses continuous metal slip rings and carbon brushes to transfer induced alternating EMF to the external circuit without altering polarity. In contrast, a direct current generator uses a split-ring commutator that mechanically reverses coil connections every half-rotation to rectify induced AC into unidirectional direct current output.

**37.** (B) Induced current in a conductor moving through a magnetic field
Fleming's Right-Hand Rule identifies the direction of induced current generated during electromagnetic induction. Stretching thumb, forefinger, and middle finger at right angles to each other aligns thumb with motion direction and forefinger with magnetic field direction, causing the extended middle finger to point in the direction of induced electric current.

**38.** (C) A step-down transformer is used at power stations for long-distance transmission.
Step-up transformers are used at power generating stations to elevate voltage levels before

Downloaded from www.pdf.tube

long-distance transmission, which minimizes transmission current and power losses. Step-down transformers are placed at distribution substations near load centers to reduce voltage to safe operational levels for industrial, commercial, and domestic end users in cities and towns.

**39.** (D) Brown, Blue, Green/Yellow
Modern Indian Standard electrical wiring codes align with international standards. Phase or live wires are color-coded brown, neutral wires are color-coded blue, and earth or ground conductors are color-coded green with yellow stripes. Older Indian domestic wiring coding traditionally used red for live, black for neutral, and solid green for protective earth connections.

**40.** (A) I and II only
Electrical overloading occurs when total current drawn exceeds a circuit's design rating. Connecting multiple high-power appliances to a single socket increases current draw beyond safety limits. Unintended supply voltage spikes also cause current surges. Operating low-power appliances on high-capacity lines does not cause overloading, making statements I and II correct.

**41.** (B) Electroplating of metals
Passing electric current through an electrolyte solution drives chemical reactions at the electrode surfaces. In electroplating, oxidation at the anode releases metal ions into solution, while reduction at the cathode deposits a uniform metallic layer onto a substrate object. This process utilizes chemical effects of current for corrosion protection and decorative coating.

**42.** (B) The total electric charge passed through the electrolyte
Faraday's First Law of Electrolysis states that chemical deposition or liberation at an electrode is proportional to total electric charge passing through an electrolyte solution. Charge equals electric current multiplied by elapsed time. Therefore, mass deposited equals electrochemical equivalent constant Z multiplied by current and time, establishing linear dependence on charge.

**43.** (D) Statement I is false but Statement II is true.
Primary cells convert internal chemical energy into electrical energy through irreversible chemical reactions, making them non-rechargeable once active chemicals are consumed. Secondary cells, such as lead-acid batteries, rely on reversible electrochemical reactions. Passing current in the reverse direction restores original active materials, allowing secondary cells to undergo multiple charge-discharge cycles.

**44.** (C) It reduces transmission current, minimizing $I^2R$ power losses.
Transmitting electrical power at high voltage reduces current proportionally for a given power level. Because power dissipation along transmission conductors equals current squared times line resistance, lowering line current minimizes heat losses significantly. This enhances overall transmission efficiency across electrical grid infrastructure over long transmission distances.

**45.** (A) I, III, II, IV
Comparing major power generation projects in Rajasthan by installed capacity places Suratgarh Super Thermal Power Station first at over 2800 MW, followed by Chhabra Super Thermal Power Project at 2320 MW. Ramgarh Gas Thermal Station operates at approximately 600 MW, and Mahi Hydel Power Project has a smaller capacity around 140 MW.

**46.** (C) Photons loosen electrons in the semiconductor, generating current across the P-N junction.
Photovoltaic energy conversion relies on the photovoltaic effect in semiconductor materials forming p-n junctions. Incoming solar photons with energy exceeding the semiconductor bandgap collide with bound electrons, exciting them into the conduction band to create electron-hole pairs. Built-in junction electric fields separate these carriers, driving electric current through external connected circuits.

**47.** (B) MCCB - Used only for low-current home appliances
Molded Case Circuit Breakers are designed for heavy-duty industrial and high-current electrical distribution networks rather than low-current residential appliances. They handle currents ranging from tens to thousands of amperes and feature adjustable trip parameters. Miniature Circuit Breakers serve low-current domestic applications, making the description of MCCB incorrect.

NODIA

**48.** (D) The algebraic sum of changes in potential must be zero.
Kirchhoff's Voltage Law states that the algebraic sum of electric potential differences around any closed loop in a circuit equals zero. This reflects energy conservation, as an electric charge completing a full loop around a closed circuit gains and loses energy such that net work done per unit charge equals zero.

**49.** (A) LEDs convert more electrical energy to light instead of heat.
Light Emitting Diodes operate via electroluminescence across a p-n junction, directly converting electric energy into visible light photons. Unlike incandescent lamps that waste over 90 percent of energy as heat, LEDs dissipate minimal thermal energy. This higher electrical-to-light conversion efficiency significantly reduces electrical power consumption for equivalent illumination output.

**50.** (A) I, II and IV
Smart electricity meters use solid-state digital electronics and wireless communication modules to eliminate manual readings, enable demand-side management via real-time consumption tracking, and support net metering for renewable integration. Mechanical gears and analog dials belong exclusively to obsolete electromechanical meters, making statements one, two, and four correct.

**51.** (A) Ampere-hour
Electric power represents the rate of electrical energy consumption per unit time, measured in Watts, Joules per second, or Volt-Amperes. Ampere-hour represents the product of electric current and time, which measures total electric charge stored or delivered rather than power, making the Ampere-hour an invalid unit for electrical power.

**52.** (D) 2.5 ohms
Cutting a uniform 10 ohm wire into two equal halves divides its length equally, producing two separate resistor pieces of 5 ohms each. Connecting these two 5 ohm resistors in a parallel configuration yields an equivalent overall resistance calculated as 5 divided by 2, resulting in a final circuit resistance of 2.5 ohms.

**53.** (B) An ohmic device
An electrical component that strictly follows Ohm's law maintains a constant resistance regardless of applied voltage or current. Its voltage-current characteristic curve forms a linear straight line passing directly through the origin of coordinates. Such electrical components, including standard metallic conductors at constant temperature, are formally classified as ohmic devices.

**54.** (C) Material and temperature
Electrical resistivity is an intrinsic material property that measures opposition to electrical current. Unlike total resistance, resistivity is independent of conductor geometry such as length, cross-sectional area, shape, or mass. It depends exclusively on the atomic material composition of the conductor and operating temperature, which affects internal charge carrier scattering.

**55.** (B) P-3, Q-4, R-2, S-1
In standard international electrical units, electric potential is measured in Volts, electrical resistance is measured in Ohms, electric power is measured in Watts, and energy is measured in Joules. Matching physical quantities with their corresponding SI units pairs potential with Volt, resistance with Ohm, power with Watt, and energy with Joule.

**56.** (C) Statement I is true but Statement II is false.
A closed switch completes a circuit, creating an ideal path with virtually zero resistance for current flow. A voltmeter measures electric potential difference across two points and must be connected in parallel across components. Connecting voltmeters in series would block current due to extremely high internal resistance, rendering Statement II incorrect.

**57.** (B) $P = \frac{V^2}{R}$
Electric power in a circuit element equals the product of potential difference V and current I. Substituting Ohm's law, where current I equals voltage V divided by resistance R, into the power formula yields power P equal to V squared divided by R. This enables direct calculation of power from voltage and resistance.

**58.** (B) 1 hour
The kilowatt-hour is the commercial billing unit of electrical energy. Energy consumed

Click Here to Buy book on Amazon

equals electric power in kilowatts multiplied by operational time in hours. An electrical appliance rated at 1000 Watts equals 1 kilowatt. Operating this 1 kilowatt appliance continuously for 1 hour consumes exactly one kilowatt-hour of total electrical energy.

**59.** (A) Germanium - Transistors and diodes
Germanium is a group-IV semiconductor material featuring intermediate electrical conductivity between conductors and insulators. Along with silicon, germanium is widely used in semiconductor electronic devices such as transistors and diodes. Polystyrene is an insulator, nichrome is an alloy used for heating elements, and tungsten is used for incandescent lamp filaments.

**60.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The magnetic field at the center of a circular current-carrying loop is proportional to the number of turns N. Because current flows in the same sense through every turn, individual magnetic fields produced by each turn superimpose constructively, multiplying total magnetic field strength by N, making Reason the correct explanation.

**61.** (D) It produces only direct current at its armature prior to commutation.
An electric generator produces alternating current in its rotating armature coil through continuous electromagnetic induction, as magnetic flux linkages alternate with coil rotation. A DC generator converts internal alternating EMF into direct current output externally by using a split-ring commutator, whereas AC generators deliver alternating current externally via slip rings.

**62.** (C) The direction of the magnetic field lines
Maxwell's Right-Hand Thumb Rule determines magnetic field direction around a current-carrying conductor. Grasping a straight conductor with the right hand so the extended thumb points along electric current direction causes the remaining curled fingers to encircle the conductor in the direction of concentric circular magnetic field lines.

**63.** (B) Electric bell
An electric bell operates on the magnetic effect of electric current, utilizing an electromagnet to mechanically attract an iron armature and strike a metallic gong. Electric irons, electric toasters, and room heaters operate on Joule heating, converting electrical energy directly into thermal heat through high-resistance metallic heating elements.

NODIA

**64.** (D) Because current decreases proportionally as voltage increases, keeping power constant.
In an ideal transformer, input power equals output power according to energy conservation. Power equals the product of potential difference V and electric current I. When voltage is stepped up by a factor, electric current decreases by the exact same proportion, ensuring total electrical energy and power remain strictly conserved.

**65.** (B) I and III only
Fuses must connect in series with live wires so that opening the fuse isolates connected appliances from supply voltage. MCBs utilize bimetallic strips for overload thermal tripping and solenoids for short-circuit magnetic tripping. Earthing protects humans against electric shock from leakage currents rather than voltage fluctuations, making statements I and III correct.

**66.** (C) Dilute Sulfuric acid
Lead-acid storage batteries utilize dilute sulfuric acid solution as their active chemical electrolyte. During discharging, lead dioxide positive plates and spongy lead negative plates react with sulfuric acid to form lead sulfate and water. Recharging reverses this electrochemical reaction, fully restoring active electrode materials and sulfuric acid electrolyte concentration.

**67.** (D) Statement I is false but Statement II is true.
Pure water contains very low concentrations of free hydrogen and hydroxyl ions, making it a poor electrical conductor that cannot undergo rapid electrolysis. Adding small amounts of acid or base provides mobile dissolved ions, significantly enhancing electrical conductivity and enabling efficient electrochemical decomposition into pure hydrogen and oxygen gases.

**68.** (D) Primary cells cannot be recharged after use, whereas secondary cells are rechargeable.
Primary electrochemical cells rely on irreversible chemical reactions that consume active materials during discharge, preventing electrical recharging once exhausted. Secondary cells utilize reversible chemical reactions. Applying an external

electrical current in the reverse direction restores original chemical composition, enabling repeated charge and discharge operational cycles over prolonged periods.

**69.** (B) Power Grid Corporation of India Limited (POWERGRID)
Power Grid Corporation of India Limited is a central public sector undertaking responsible for planning, executing, and operating the inter-state transmission system across India. POWERGRID manages national grid operations to facilitate bulk power transfer across regional boundaries, maintaining grid frequency and stability across regional electricity distribution networks throughout the country.

**70.** (C) JVVNL handles eastern, JdVVNL handles western, and AWVNL handles central/southern Rajasthan.
Electrical power distribution in Rajasthan is managed by three state DISCOMs structured geographically. Jaipur Vidyut Vitran Nigam Limited manages eastern districts, Jodhpur Vidyut Vitran Nigam Limited covers western desert regions, and Ajmer Vidyut Vitran Nigam Limited oversees central and southern districts across the state of Rajasthan.

**71.** (D) Bhadla Solar Park
Bhadla Solar Park, situated in Jodhpur district of Rajasthan, is one of the largest solar power parks in the world with a total operational capacity exceeding 2245 MW. Spanning thousands of acres of arid land, it plays a key role in advancing India's renewable energy goals and solar power installation targets.

**72.** (A) For high-current industrial applications with adjustable trip settings.
Molded Case Circuit Breakers handle higher electric current ratings ranging up to 2500 Amperes, making them suitable for industrial distribution systems. Unlike standard Miniature Circuit Breakers that feature fixed trip characteristics, MCCBs offer adjustable overload and short-circuit trip settings, facilitating precise system protection in complex industrial and commercial electrical installations.

**73.** (B) KVL is based on the principle of conservation of momentum of electrons.
Kirchhoff's Voltage Law is based on conservation of energy, stating that total work done per unit charge moving around any closed loop equals zero. Kirchhoff's Current Law is based on conservation of electric charge. Asserting that Kirchhoff's Voltage Law relies on the conservation of electron momentum is physical and fundamentally incorrect.

**74.** (B) Leaving appliances in standby mode rather than turning them off completely.
Electrical appliances left in standby mode continue to draw vampire power, wasting electrical energy over extended periods. Effective conservation measures include utilizing natural daylighting, installing appliances with high Bureau of Energy Efficiency star ratings, and using solar thermal water heaters, whereas standby mode operation continuously increases unnecessary electrical energy consumption.

**75.** (B) I, III and IV
Digital electricity meters utilize solid-state microcontrollers to measure energy usage accurately without moving mechanical parts. Advanced smart meters incorporate remote communication for telemetry, resist magnetic field tampering, and transmit energy data. Rotating disks belong to electromechanical meters, making statements one, three, and four fully correct.

**76.** (C) Cross-sectional area
Resistance of a uniform conductor is directly proportional to its length and resistivity, and inversely proportional to its cross-sectional area. Increasing the cross-sectional area provides a wider conductive pathway for drifting free electrons, thereby reducing internal scattering collisions and decreasing overall electrical opposition to current flow.

**77.** (D) 220 V, 50 Hz
The single-phase AC electricity supply in Indian households is standardized at a RMS voltage of 220 Volts and a nominal frequency of 50 Hertz. This single-phase alternating potential difference continuously alternates direction fifty complete cycles every second to operate domestic electrical appliances safely and efficiently.

**78.** (C) Statement I is true but Statement II is false.
Ohm's law requires constant physical conditions, such as temperature, because resistance varies with thermal changes. Under constant temperature, the V-I graph for an ohmic

Downloaded from www.pdf.tube

conductor forms a straight line passing through the origin, not a parabola. Thus, Statement I is physically correct while Statement II is false.

**79.** (B) To allow each appliance to operate independently if another fails.
Domestic wiring uses parallel circuits so that each appliance receives full line voltage independently. Parallel connections allow appliances to operate with dedicated switches without affecting others. If one appliance fails or switches off, parallel branches remain closed, ensuring continuous, uninterrupted power supply to all remaining household electrical appliances.

**80.** (A) P-2, Q-3, R-4, S-1
Copper is a metallic conductor with high conductivity. Glass is an insulator with high resistance that blocks current. Silicon is a semiconductor with intermediate conductivity that increases with temperature. Superconductors below critical temperature exhibit zero resistance, conducting electric current continuously without any energy dissipation as heat.

**81.** (A) Cell - Two parallel lines of equal length
The standard circuit symbol for an electric cell consists of two parallel vertical lines of unequal length and thickness. The longer, thinner line represents the positive terminal, while the shorter, thicker line represents the negative terminal. Equal-length parallel lines represent a capacitor, making the specified cell symbol description incorrect.

**82.** (C) Four times its original value
Electric power dissipated in a fixed resistor equals current squared times resistance. Because power varies directly with the square of electric current, doubling current quadruples power dissipation. Multiplying current by two increases power by two squared, resulting in exactly four times the original dissipated power output.

**83.** (A) Electric generator
An electric generator converts mechanical rotational energy into electrical energy using electromagnetic induction. In contrast, electric toasters, electric geysers, and electric fuses operate on the heating effect of electric current, converting electrical energy into thermal heat via high-resistance conductor elements.

**84.** (D) Decreases
In intrinsic semiconductors, elevating temperature provides thermal energy to break covalent bonds, creating free electron-hole pairs. This increase in charge carrier density enhances electrical conductivity. Because conductivity is inversely proportional to electrical resistance, temperature increases cause pure semiconductor resistance to decrease significantly and exponentially.

**85.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Parallel conductors carrying currents in the same direction generate magnetic fields that interact to create mutual attractive forces. The magnetic field from one wire exerts a Lorentz force on moving charge carriers in the adjacent wire directed toward the first wire, providing the precise physical mechanism behind this observed magnetic attraction.

**86.** (C) Soft iron
Soft iron is preferred for electromagnet cores because of its high magnetic permeability and low coercivity. High permeability concentrates magnetic flux to produce strong magnetic fields. Low coercivity ensures rapid demagnetization when current switches off, preventing unwanted residual magnetism within the core material.

NODIA

**87.** (D) The middle finger represents the direction of the magnetic field.
Fleming's Left-Hand Rule uses three mutually perpendicular fingers to determine mechanical force. The forefinger represents magnetic field direction, the middle finger represents electric current direction, and the extended thumb represents motion or force direction. Stating that the middle finger represents magnetic field direction is physically incorrect.

**88.** (A) Step-up transformer
In ideal transformers, the transformation ratio of secondary to primary voltage equals the ratio of secondary to primary turn numbers. When the secondary coil contains more turns than the primary coil, secondary voltage exceeds primary voltage. This configuration steps up alternating potential difference, acting directly as a step-up transformer.

**89.** (A) Both Statement I and Statement II are true.
Connecting the earth wire to metallic enclosures of heavy appliances provides safety protection. If insulation degrades and a live wire contacts metal housing, earthing offers a low-resistance path to ground. This prevents dangerous voltage buildup on metal frames and safely directs stray fault current to earth.

**90.** (B) I and III only
Short circuits occur when live and neutral conductors make direct contact, drastically reducing loop resistance and causing current surges. Thermal insulation aging, wire degradation, and physical cable damage lead to short circuits. Operating high-power appliances on adequately rated circuits represents normal load conditions, making statements one and three correct.

**91.** (A) Hans Christian Oersted
In 1820, Hans Christian Oersted discovered the magnetic effect of electric current during a lecture demonstration. He observed that a magnetic compass needle deflected when placed near a wire carrying electric current, proving that moving electric charges create surrounding magnetic fields in space.

**92.** (C) Faraday's First Law of Electrolysis
Faraday's First Law of Electrolysis provides the mathematical formula m equals Z I t to calculate chemical mass deposited during electrolysis. Mass m depends on electrochemical equivalent Z, current I in Amperes, and time t in seconds. This principle allows precise calculation of copper deposited on cathodes during copper sulfate electrolysis.

**93.** (D) Their electrochemical reactions are highly reversible, allowing them to be recharged.
Secondary cells, including Lithium-ion batteries, are characterized by reversible electrochemical reactions. When discharging, internal chemical potential converts to electrical energy. Applying external voltage during charging forces current in reverse, restoring original active chemical species. This enables hundreds to thousands of recharge cycles in modern consumer electronic devices.

**94.** (C) Step voltage levels using transformers for transmission or distribution.
Electrical substations connect power plants, transmission lines, and local distribution networks. Their primary function involves using transformers to step up voltage levels for efficient long-distance transmission, or stepping down voltage to safer levels for industrial, commercial, and residential energy distribution, while housing switching and protective circuit equipment.

**95.** (A) I, III, IV, II
The logical path of electric power begins with power plant generation at moderate voltages like 11 kV. Step-up transformers raise voltage to high levels like 220 kV or 400 kV for efficient long-distance transmission over grid networks. At local distribution substations, step-down transformers lower voltage to 220 V for domestic consumption.

**96.** (D) Solarizing agricultural pumps and providing grid-connected solar power to farmers.
The PM-KUSUM scheme aims to provide energy security to Indian farmers. In Rajasthan, the scheme focuses on solarizing standalone agricultural water pumps and enabling farmers to set up grid-connected solar power plants on barren lands. This provides reliable daytime irrigation power while generating additional income through surplus electricity feed-in.

**97.** (A) Both Statement I and Statement II are true.
Residual Current Circuit Breakers monitor current vectors in live and neutral supply conductors. Under normal conditions, outgoing live current equals returning neutral current. If a person touches live wiring, stray leakage current flows through their body to earth, creating a current imbalance that RCCB senses, triggering rapid automatic circuit disconnection.

**98.** (C) Negative
Kirchhoff's laws require assigning assumed reference directions for branch currents before setting up linear mesh equations. If the solved mathematical value for a current variable turns out negative, it indicates that actual electric current flows in the direction opposite to the assumed reference arrow, maintaining complete algebraic and physical consistency.

Click Here to Buy book on Flipkart

**99.** (A) Installing motion sensors and daylight harvesting for LED lighting.
Sustainable energy conservation in commercial facilities combines highly efficient LED fixtures with automated controls. Installing motion sensors ensures lighting operates only during occupancy, while daylight harvesting dimmers adjust artificial illumination based on ambient natural sunlight, maximizing energy savings while maintaining proper workspace illumination levels throughout operational hours.

**100.** (B) I, III and IV
Smart meters enable advanced functionalities in modern power distribution, including prepaid billing models, rapid outage localization, and consumer usage monitoring via smartphone applications. While smart meters improve billing accuracy and reduce technical losses, physical line losses in distribution conductors persist due to wire resistance, making statement number two physically false.

**101.** (D) Statement I is false but Statement II is true.
Electric current in metallic conductors is carried exclusively by negatively charged free electrons, while positively charged atomic protons remain fixed in the crystal lattice. By historical convention, electric current direction is defined along positive charge movement, which is opposite to actual electron drift direction, making Statement II fully correct.

**102.** (C) $V_{\text{rms}} = \frac{V_0}{2}$
For sinusoidal alternating current waveforms, Root Mean Square voltage represents equivalent direct current voltage delivering identical heating power to a resistor. RMS voltage mathematically equals peak voltage V0 divided by square root of two, approximately equal to 0.707 times peak voltage value in sinusoidal alternating current systems.

**103.** (D) It holds true for non-linear components like vacuum tubes and transistors.
Ohm's law applies to linear conductors where potential difference and current maintain direct proportionality at constant temperature. Non-linear semiconductor devices like diodes, transistors, and thermionic vacuum tubes do not obey Ohm's law because their internal resistance varies with applied potential, causing complex non-linear voltage-current characteristic relationships.

**104.** (A) 80 ohms
Resistance formula R equals resistivity times length divided by cross-sectional area. Area depends on radius squared. Doubling length multiplies resistance by two. Halving radius reduces area to one-fourth, multiplying resistance by four. Combining length doubling and radius halving increases resistance eightfold, transforming initial 10 ohms into 80 ohms final resistance.

**105.** (A) P-3, Q-4, R-1, S-2
A galvanometer detects small electric currents, a capacitor stores electric charge, a resistor opposes electric current flow, and a rectifier converts alternating current into direct current. Matching these components with their primary functions pairs component P with 3, Q with 4, R with 1, and S with 2.

**106.** (B) Live (Phase) wire
Switches in domestic wiring must always be connected in series with the live wire. When switched off, opening the live conductor isolates appliances completely from high supply potential, preventing electric shock hazards when touching appliance terminals. Connecting switches in neutral leaves appliances energized at line voltage even when switched off.

NODIA

**107.** (A) Energy (E) = Power (P) × Time (t)
Electrical energy measures total work performed by electric current over an operational duration. Power represents energy consumption rate per unit time. Therefore, integrating power over operational time yields energy equal to power P multiplied by time t, expressed in fundamental Joules or commercial kilowatt-hours.

**108.** (C) 10 W LED Bulb
Electrical energy consumption depends on power rating and operational time. High-wattage loads like air conditioners, geysers, and irons consume between 1500 and 2000 Watts. Operating a 10 Watt LED bulb for one hour consumes only 0.01 kWh, making it account for the smallest fraction of a domestic electricity bill.

**109.** (D) Their conductivity can be precisely controlled by doping and voltage.
Semiconductors are widely used in electronics because their electrical conductivity can be altered across wide ranges. Introducing trace impurities through doping, applying external

electric fields, or altering temperature controls free charge carrier concentrations, enabling fabrication of diodes, transistors, and integrated microcircuits with precise electronic switching and amplification capabilities.

**110.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Soft iron exhibits low retentivity and low coercivity, making it easy to magnetize and demagnetize rapidly under alternating magnetic fields. Thin magnetic hysteresis loops minimize thermal energy dissipation during continuous cyclic magnetization, making soft iron the ideal core material for transformers and electromagnets to minimize internal hysteresis losses.

**111.** (B) Alternating Current
In electric generators, slip rings connect the rotating armature coil continuously to external stationary carbon brushes. As the coil rotates through a stationary magnetic field, induced electromotive force naturally alternates direction every half turn, producing alternating current output across external circuit terminals connected to these slip rings.

**112.** (A) Both Statement I and Statement II are true.
Electric current flowing along a straight wire generates concentric circular magnetic field lines in surrounding planes perpendicular to the conductor. Maxwell's Right-Hand Grip Rule specifies that reversing current flow direction reverses the circular orientation of surrounding magnetic field lines, making both Statement I and Statement II physically true.

**113.** (A) Steady DC produces no changing magnetic flux to induce voltage.
Transformers operate through mutual electromagnetic induction, requiring time-varying magnetic flux to induce voltage in secondary windings. Applying constant direct current produces static, unchanging magnetic flux inside the transformer iron core, which fails to induce electromotive force in the secondary winding, rendering transformers completely non-functional for DC voltage step-up operations.

**114.** (C) Amperes
Fuse ratings specify maximum electric current a fuse wire conducts continuously without melting. Specified in Amperes, fuse current ratings define safety boundaries for electrical circuits. When current exceeds rated Amperes, Joule heating melts the fuse element to break the circuit and protect connected electrical infrastructure from overcurrent damage.

**115.** (B) II and III only
Fuse wires require low melting points to melt quickly during overcurrent conditions. MCBs can be reset manually after tripping, avoiding wire replacement required by traditional fuses. Short circuits dramatically drop loop resistance, causing high fault currents. Therefore, statements II and III are correct while statement number one is physically false.

**116.** (D) An electrolyte
An electrolyte is a liquid containing mobile ions capable of conducting electricity through ionic migration. When potential difference is applied across submerged electrodes, cations move to the cathode and anions move to the anode, causing chemical oxidation-reduction reactions and chemical decomposition termed electrolysis.

**117.** (B) Lead-acid accumulator
Lead-acid accumulators are secondary rechargeable batteries that use reversible electrochemical reactions. In contrast, Zinc-Carbon dry cells, Alkaline cells, and Mercury button cells are primary non-rechargeable cells that convert active chemical reactants into electrical energy until exhausted, making the lead-acid accumulator the distinct odd item.

**118.** (B) 11 kV → 33 kV → 132 kV → 220 kV
In Indian power system design, voltage levels increase hierarchically from local distribution to extra-high voltage transmission networks. Standard voltage steps range from 11 kV distribution, through 33 kV sub-transmission, up to 132 kV and 220 kV primary transmission levels, establishing a clear ascending operational voltage sequence.

NODIA

**119.** (D) Operating state-owned thermal, hydel, and gas power stations.
Rajasthan Rajya Vidyut Utpadan Nigam Limited is the unbundled state government enterprise responsible for power generation in Rajasthan. RRVUNL owns, operates, and maintains state-owned thermal power plants, hydroelectric stations, and gas turbine facilities, leaving

transmission and distribution responsibilities to separate dedicated regional power utility entities.

**120.** (A) P-4, Q-3, R-2, S-1
Bhadla Park is a mega solar photovoltaic park, PM-KUSUM Component B focuses on off-grid solar water pumping systems, Rawatbhata houses nuclear power generation reactors, and the Jaisalmer region features major wind energy installations, pairing P with 4, Q with 3, R with 2, and S with 1 in Rajasthan.

**121.** (B) South
Rajasthan is located in the Northern Hemisphere above the Tropic of Cancer. To capture maximum annual solar irradiance without active solar tracking systems, static solar photovoltaic collector panels in this geographic region are oriented facing true geographic south at an optimal tilt angle matching regional latitude.

**122.** (B) RCCB / ELCB
Residual Current Circuit Breakers (RCCB) and Earth Leakage Circuit Breakers (ELCB) detect small residual earth leakage fault currents as low as 30 milliamperes. When a body ground fault occurs, the resulting current imbalance trips the device in milliseconds, interrupting supply power before fatal electric shock occurs.

**123.** (A) KVL - Sum of all currents in a closed loop is always strictly zero
Kirchhoff's Voltage Law governs potential differences in closed loops, stating that the algebraic sum of potential drops and electromotive forces around a closed loop equals zero. Summing currents applies to nodes in Kirchhoff's Current Law, making the specified statement defining KVL via current summation incorrect.

**124.** (C) Shift flexible loads to off-peak hours to balance grid demand.
Time of Day metering applies differential electricity tariffs across different hours. Charging higher rates during peak demand hours and lower rates during off-peak hours incentivizes consumers to shift non-critical power usage, helping utilities smooth grid load profiles and minimize expensive peak thermal power generation.

**125.** (C) I, II and III
Inverter air conditioners adjust motor speed dynamically, BLDC ceiling fans utilize efficient brushless motors, and BEE operates under the Ministry of Power. Efficient appliances maintain long operational lifespans through modern power electronics, making statement IV false while statements one, two, and three are fully correct.

**126.** (C) 600 Coulombs
Electric charge Q equals the product of electric current I and elapsed time t in seconds. Converting 10 minutes into seconds gives 600 seconds. Multiplying current of 1 Ampere by 600 seconds yields a total electric charge of 600 Coulombs passing through the filament circuit.

**127.** (B) One (Unity)
In purely resistive AC circuits, current and voltage waveforms remain in phase with zero phase angle difference. The power factor equals the cosine of this phase angle. Because cosine of zero degrees equals one, a purely resistive AC circuit operates with a unity power factor of exactly one.

**128.** (A) II, I, III, IV
Electrical conductivity depends on intrinsic electron mobility and metal resistivity. Silver exhibits highest electrical conductivity among metals, followed by copper, aluminum, and tungsten. Arranging these metals in sequence from highest conductivity to lowest yields silver first, copper second, aluminum third, and tungsten fourth at room temperature.

**129.** (A) Increase by 300%
Electric power dissipated equals voltage squared divided by resistance. Increasing voltage by 100 percent doubles potential difference to 2V. Squaring doubled voltage quadruples power dissipation to 4P. Subtracting initial power P yields a net power increase of 3P, corresponding directly to a 300 percent increase.

**130.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
High tension transmission lines use bare uninsulated conductors because thick rubber insulation would add immense weight and cost. Air gap insulation around conductors set on tall transmission towers provides dielectric breakdown strength, preventing accidental contact while reducing physical conductor weight, making Reason the correct physical explanation for Assertion.

Downloaded from www.pdf.tube

**131.** (A) Increases significantly
Inserting a soft iron bar into a current-carrying solenoid increases interior magnetic field strength. Soft iron possesses high magnetic permeability, causing domain alignment in response to solenoid field lines. Concentrated induced magnetic flux within the iron core enhances net magnetic induction by hundreds of times over air.

**132.** (A) Both Statement I and Statement II are true.
In DC motors, commutators reverse current direction in armature windings every half-rotation, ensuring continuous unidirectional torque. Carbon brushes maintain sliding electrical contact with rotating commutator segments, providing continuous electrical connectivity while minimizing mechanical wear, making both Statement I and Statement II fully true.

**133.** (B) Internal resistance of the coil wire
Faraday's Law of Electromagnetic Induction dictates that induced electromotive force equals coil turn number times time rate of change of magnetic flux. While induced current depends on total circuit resistance, induced electromotive force depends on magnetic flux change rate, external magnetic field, and coil turns, not internal coil wire resistance.

**134.** (C) The top pin connects earth first and disconnects last for safety.
In three-pin plugs, the top ground pin is physically longer and thicker than live and neutral pins. Being longer ensures ground connects first during insertion and disconnects last during removal, establishing early earth protective ground connection before internal appliance live lines fully energize.

**135.** (D) I, II and III
Electroplating deposits metal onto conductive objects via electrolytic oxidation-reduction. The substrate object acts as the cathode where target metal ions reduce and deposit. The source metal acts as the anode, dissolving into electrolyte containing target metal cations, making statements one, two, and three fully correct.

**136.** (A) The charge capacity of the battery
Ampere-hour measures battery charge capacity, representing total electric charge stored in electrochemical cells. One Ampere-hour equals continuous current delivery of one Ampere for one hour, corresponding to 3600 Coulombs of charge. It indicates battery discharge duration under specific connected load current demands.

**137.** (C) Statement I is true but Statement II is false.
Rajasthan unbundled its power sector into distinct state entities. Discoms handle electricity distribution across designated geographic zones. RRVUNL handles state power generation, while RVPNL handles intra-state power transmission. Reversing duties between RVPNL and RRVUNL makes Statement II false while Statement I remains true.

**138.** (A) I, II and III
Voltage-operated ELCBs detect potential differences between equipment casing and earth ground, RCCBs sense vector current imbalances between live and neutral wires, and MCBs use bimetallic strips for thermal overload protection. Electrical fuses offer poor earth leakage protection compared to RCCBs, making statement IV false while statements I, II, and III are correct.

NODIA

**139.** (A) A point where two or more circuit elements are connected together.
In electrical network theory, a node is defined as an interconnection point or junction where two or more circuit components connect together. Kirchhoff's Current Law applies directly at circuit nodes, requiring total electric current entering a node to equal total current exiting to conserve total electric charge.

**140.** (C) Lower electricity consumption and reduced greenhouse gas emissions.
Energy-efficient electrical appliances consume less electric power for equivalent utility output, reducing residential kilowatt-hour demand. Lowering electricity generation demand reduces fossil fuel combustion at thermal power stations, decreasing greenhouse gas emissions like carbon dioxide and lowering utility electricity billing costs for end consumers.

www.nodia.in

# CHAPTER 05
# Heat, Work and Energy

**1.** Which of the following statements best describes the fundamental difference between heat and temperature?
(A) Heat is the measure of the average kinetic energy of molecules, while temperature is the total thermal energy.
(B) Temperature is a measure of the average kinetic energy of molecules, while heat is the total energy transferred due to a temperature difference.
(C) Heat is an intensive property, whereas temperature is an extensive property of a system.
(D) Both heat and temperature represent the total internal energy of a substance but are measured in different units.

**2.** The transfer of thermal energy between two bodies in contact ceases when they reach a state of thermal equilibrium. What condition is strictly satisfied at this state?
(A) Both bodies contain the exact same amount of total internal energy.
(B) Both bodies have the same specific heat capacity.
(C) The heat transfer rate becomes completely zero with no molecular collision.
(D) Both bodies are at the exact same temperature.

**3.** Heat is classified as an extensive property of a thermodynamic system. Which of the following best explains this?
(A) It depends on the amount of matter present in the system.
(B) It is completely independent of the mass of the substance.
(C) It depends only on the material's specific heat capacity.
(D) It solely depends on the external pressure applied to the system.

**4.** What is the precise absolute zero temperature on the Celsius scale where molecular motion theoretically ceases?
(A) 0 °C
(B) -100 °C
(C) -273.15 °C
(D) -373.15 °C

**5.** A person has a normal body temperature of 98.6 °F. What will this temperature be when measured on the Celsius scale?
(A) 37.0 °C
(B) 36.0 °C
(C) 38.2 °C
(D) 39.5 °C

**6.** At what specific temperature do the Celsius and Fahrenheit scales read the exact same numerical value?
(A) -273°
(B) 0°
(C) 40°
(D) -40°

**7.** The Kelvin scale is widely used in scientific applications. Why is it known as an absolute temperature scale?
(A) It starts at the triple point of water.
(B) It does not have any negative values and starts at absolute zero.
(C) It maps directly to the Fahrenheit scale.
(D) Its degree increments are infinitely smaller than Celsius increments.

**8.** Match List I with List II:
**List I: (Standard Temperatures)**
P. Boiling point of water (Celsius)
Q. Freezing point of water (Fahrenheit)
R. Absolute zero (Kelvin)
S. Normal human body temp (Fahrenheit)
**List II: (Corresponding Values)**
1. 0
2. 32
3. 98.6
4. 100
(A) P-4, Q-2, R-1, S-3
(B) P-1, Q-2, R-4, S-3
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-4, R-1, S-3

Click Here to Buy book on Amazon

**9.** What is the significance of the triple point of water in thermodynamics?
(A) The specific thermodynamic temperature at which liquid water completely vaporizes.
(B) The unique point where water molecules possess the maximum possible kinetic energy.
(C) The exact temperature condition where the specific heat capacity of water becomes zero.
(D) The state where ice, liquid water, and water vapor coexist in thermal equilibrium.

**10.** Thermal conduction in solid metals is significantly faster than in non-metals. What is the primary reason for this rapid heat transfer?
(A) Presence of free electrons that rapidly transport thermal energy.
(B) The exceptionally high physical density of the metallic lattice structure.
(C) The existence of exceptionally strong ionic bonds between metal atoms.
(D) The highly rigid crystalline lattice structure preventing atomic vibration.

**11.** Which method of heat transfer does not require any material medium and can occur through a perfect vacuum?
(A) Conduction
(B) Radiation
(C) Convection
(D) Advection

**12.** Convection is the primary mode of heat transfer in liquids and gases. What acts as the driving mechanism for natural convection?
(A) Direct collision between free electrons.
(B) Differences in density caused by temperature variations.
(C) Emission of electromagnetic waves from the fluid surface.
(D) Mechanical stirring by external forces.

**13.** A thermos flask keeps hot liquids hot and cold liquids cold. How does its vacuum layer primarily prevent heat transfer?
(A) It prevents both conduction and convection.
(B) It exclusively prevents thermal radiation.
(C) It stops heat loss by reflection of infrared waves.
(D) It increases the specific heat capacity of the liquid.

**14.** Consider the following statements regarding heat transfer methods:
I. Conduction involves the bulk movement of molecules in a fluid.
II. Thermal radiation travels at the speed of light in a vacuum.
III. Convection is responsible for atmospheric phenomena like wind and weather patterns.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**15.** The phenomenon of a 'sea breeze' occurring during the day in coastal areas is a direct application of which heat transfer process?
(A) Conduction
(B) Radiation
(C) Latent heating
(D) Convection

**16.** Specific heat capacity is a crucial material property. How is it properly defined?
(A) The total amount of heat energy required to completely change the state of 1 kg of a substance.
(B) The overall total internal thermal energy contained within a standard unit mass of 1 kg.
(C) The heat required to raise the temperature of 1 kg of a substance by 1 °C.
(D) The overall rate at which thermal heat energy is continuously absorbed by a physical body.

NODIA

**17.** Water is widely used as a coolant in automobile engines. Which physical property of water makes it ideal for this purpose?
(A) Remarkably low physical density
(B) High specific heat capacity
(C) Exceptionally high boiling point
(D) Relatively low thermal conductivity

**18.** Calculate the heat energy required to raise the temperature of 2 kg of water by 10 °C. (Specific heat capacity of water = 4200 J/kg°C).
(A) 42,000 J
(B) 21,000 J
(C) 8,400 J
(D) 84,000 J

**19.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Desert areas experience severe variations between day and night temperatures.
**Reason (R):** Sand has a very low specific heat

capacity compared to water, allowing it to heat up and cool down rapidly.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**20.** Which term describes the heat required to change the state of a substance from solid to liquid without any change in temperature?
(A) Latent heat of vaporization
(B) Specific heat capacity
(C) Latent heat of fusion
(D) Molar heat capacity

**21.** When water boils and turns into steam at 100 °C, the temperature remains constant during the phase change. Where does the supplied heat energy go?
(A) It overcomes intermolecular forces to change the physical state.
(B) It is completely destroyed in accordance with the second law of thermodynamics.
(C) It rapidly increases the average kinetic energy of all individual molecules.
(D) It is immediately transferred to the surrounding environment as thermal radiation.

**22.** Burns caused by steam at 100 °C are more severe than burns caused by boiling water at exactly 100 °C. What is the physical reason?
(A) Steam is practically much hotter than boiling water despite identical thermometer readings.
(B) Steam easily penetrates into deeper layers of human skin due to its gaseous nature.
(C) The specific heat capacity of steam is significantly greater than that of boiling water.
(D) Steam releases additional latent heat of vaporization upon condensation.

**23.** What is the approximate value of the specific latent heat of vaporization of water?
(A) $3.34 \times 10^5$ J/kg
(B) $22.6 \times 10^5$ J/kg
(C) $4.18 \times 10^3$ J/kg
(D) $1.00 \times 10^5$ J/kg

**24.** Consider the following statements regarding the thermal expansion of substances:
I. Most substances expand on heating and contract on cooling.
II. Water contracts when heated from 0 °C to 4 °C.
III. The coefficient of volume expansion is three times the linear expansion coefficient.
IV. A bimetallic strip bends upon heating due to identical expansion rates of the two metals.
Which of the above statements is/are incorrect?
(A) I and II only
(B) III and IV only
(C) IV only
(D) II and III only

**25.** The anomalous expansion of water has important ecological consequences. At what temperature does pure water achieve its maximum density?
(A) 0 °C
(B) -4 °C
(C) 100 °C
(D) 4 °C

**26.** Small gaps are deliberately left between successive iron rails on a railway track. What is the primary purpose of these gaps?
(A) To allow thermal expansion of rails during hot weather.
(B) To significantly reduce friction between moving train wheels and the steel track.
(C) To save substantial amounts of construction material and reduce overall project costs.
(D) To allow rapid water drainage off the tracks during periods of heavy rainfall.

**27.** Which law of thermodynamics formally provides the foundational basis for defining and measuring temperature?
(A) First Law
(B) Zeroth Law
(C) Second Law
(D) Third Law

**28.** The First Law of Thermodynamics is essentially a restatement of which universal physical principle?
(A) Law of conservation of mass
(B) Law of conservation of energy
(C) Law of conservation of momentum
(D) Newton's third law of motion

**29.** According to the Second Law of Thermodynamics, which of the following processes is impossible?

Downloaded from www.pdf.tube

(A) Converting heat completely into work in a cycle without heat rejection.
(B) Spontaneous heat flow occurring naturally from a hotter body directly to a colder body.
(C) Converting a specific fraction of absorbed heat energy from a source into useful work.
(D) Decreasing the total thermodynamic entropy of a localized system by applying external work.

**30.** Match List I with List II:
**List I: (Thermodynamic Process)**
P. Isothermal
Q. Isobaric
R. Isochoric
S. Adiabatic
**List II: (Constant Parameter)**
1. Pressure
2. Volume
3. Heat exchange is zero
4. Temperature
(A) P-4, Q-1, R-2, S-3
(B) P-1, Q-4, R-3, S-2
(C) P-4, Q-2, R-1, S-3
(D) P-2, Q-1, R-4, S-3

**31.** In physics, the mechanical work done by a force on an object is defined mathematically. Which formula represents this correctly?
(A) $W = F / d$
(B) $W = F \times d \times \sin(\theta)$
(C) $W = m \times a \times d$
(D) $W = F \times d \times \cos(\theta)$

**32.** A person carries a heavy suitcase and walks horizontally at a constant velocity. Why is the mechanical work done against gravity equal to zero?
(A) The upward vertical force applied by the person is equal and opposite to gravity.
(B) The forward walking velocity of the person carrying the load remains strictly constant.
(C) The angle between gravitational force and displacement is 90 degrees.
(D) The heavy suitcase does not experience any significant frictional resistance forces.

**33.** A force of 20 N displaces an object by 5 meters in the exact direction of the applied force. What is the work done?
(A) 4 J
(B) 100 J
(C) 25 J
(D) 0 J

**34.** In a force-displacement graph plotted for a moving body, what physical quantity does the area under the curve represent?
(A) Total power output
(B) Change in momentum
(C) Average acceleration
(D) Total work done

**35.** Work done can be positive, negative, or zero. Which of the following is an example of strictly negative work?
(A) The work done by kinetic friction on a sliding block.
(B) Pushing a block across a frictionless surface.
(C) The work done by gravitational force on an object in free fall.
(D) A satellite orbiting the earth in a circular path.

**36.** Which of the following is the most accurate physical definition of energy?
(A) The time rate of change of linear momentum of a moving body.
(B) The net external force required to maintain a strictly constant velocity.
(C) The capacity of a system to perform work.
(D) The precise quantitative measure of thermal equilibrium state in a system.

NODIA

**37.** Energy exists in various forms and is a fundamental scalar quantity. Which characteristic best describes a scalar quantity?
(A) It possesses only magnitude without any direction.
(B) It possesses both magnitude and specific direction.
(C) It requires a specific frame of reference for magnitude.
(D) It can only have strictly positive values.

**38.** The principle of conservation of energy states that in an isolated system, the total energy:
(A) Continually decreases due to frictional losses.
(B) Transforms entirely into heat over time.
(C) Increases when work is done internally.
(D) Remains constant, though it may change forms.

**39.** Which of the following equations correctly links kinetic energy (K) to linear momentum (p) for an object of mass m?
(A) $K = p \times m$
(B) $K = p^2 / (2m)$
(C) $K = 2p / m$

(D) $K = (p \times m)^2$

**40.** A car's speed is uniformly doubled. By what exact factor will its kinetic energy change?
(A) It remains entirely unchanged and constant.
(B) It doubles (increases by a factor of 2).
(C) It quadruples (by a factor of 4).
(D) It increases significantly by a factor of 8.

**41.** Potential energy is the energy possessed by an object due to its position or configuration. What is the gravitational potential energy of a 10 kg object raised to a height of 5 meters? (Take $g = 9.8\ m/s^2$)
(A) 50 J
(B) 98 J
(C) 250 J
(D) 490 J

**42.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** According to the Work-Energy Theorem, the net work done on an object equals the change in its kinetic energy.
**Reason (R):** Energy is always lost when work is done against conservative forces like gravity.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**43.** A simple pendulum oscillates continuously in an ideal vacuum without friction. At the mean (lowest) position of its swing, which statement is true?
(A) Both potential energy and kinetic energy momentarily become zero.
(B) Kinetic energy is maximum, potential energy is minimum.
(C) Potential energy reaches maximum, while kinetic energy drops to zero.
(D) Total mechanical energy of the pendulum reaches its maximum value.

**44.** During the oscillation of a simple pendulum, the restoring force that brings the bob back toward the mean position is a component of:
(A) Air resistance
(B) Gravitational force
(C) Tension strictly acting upwards
(D) Centrifugal force

**45.** Consider the following statements about a freely falling body in a vacuum:
I. Its kinetic energy continuously increases.
II. Its potential energy continuously decreases.
III. Its total mechanical energy remains entirely constant.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**46.** Mechanical power is defined as the rate at which work is done. Which formula effectively represents power in terms of force (F) and velocity (v)?
(A) $P = F / v$
(B) $P = F \times v^2$
(C) $P = F \times v$
(D) $P = F / v^2$

**47.** An electric motor performs 6000 Joules of work in 1 minute. What is the mechanical power output of the motor?
(A) 6000 W
(B) 10 W
(C) 60 W
(D) 100 W

**48.** The horsepower (hp) is a traditional unit of power frequently used for engines. One horsepower is approximately equivalent to how many Watts?
(A) 1000 W
(B) 550 W
(C) 746 W
(D) $3.6 \times 10^6$ W

**49.** Renewable energy sources are vital for sustainable development. Which of the following is fundamentally defined as a non-renewable energy source?
(A) Hydroelectric power
(B) Natural gas
(C) Geothermal energy
(D) Biomass

**50.** Biomass energy is generated from organic material. When biomass decomposes in the absence of oxygen, it produces biogas. What is the primary constituent of biogas?
(A) Carbon dioxide
(B) Hydrogen sulfide

Click Here to Buy book on Flipkart

(C) Butane
(D) Methane

**51.** Consider the following stages of energy transformation in a conventional hydroelectric power plant:
I. Kinetic energy of flowing water
II. Potential energy of stored water
III. Electrical energy output
IV. Mechanical energy of rotating turbine
Select the correct sequential order from the options given below:
(A) II → I → IV → III
(B) I → II → IV → III
(C) II → IV → I → III
(D) IV → I → II → III

**52.** Wind turbines convert the kinetic energy of wind into electricity. What is roughly the minimum sustained wind speed required for the effective commercial operation of wind turbines?
(A) 5 km/h
(B) 50 km/h
(C) 15 km/h
(D) 100 km/h

**53.** Select the correct order of the given coal types arranged strictly by increasing carbon content.
(A) Lignite, Peat, Anthracite, Bituminous
(B) Peat, Lignite, Bituminous, Anthracite
(C) Bituminous, Lignite, Peat, Anthracite
(D) Anthracite, Bituminous, Lignite, Peat

**54.** Consider the following statements regarding non-renewable fossil fuels:
I. Petroleum is primarily separated into useful fractions via fractional distillation.
II. The combustion of coal releases sulfur oxides, contributing heavily to acid rain.
III. Natural gas burns significantly dirtier than coal, releasing more carbon particulate matter.
Which of the above statements is/are incorrect?
(A) I only
(B) II only
(C) III only
(D) I and II

**55.** Nuclear power plants utilize controlled atomic reactions to generate heat. Which physical process is strictly utilized in all commercial nuclear power reactors today?
(A) Nuclear fusion
(B) Nuclear fission
(C) Alpha decay
(D) Positron emission

**56.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Control rods are an essential safety and operational component in a nuclear fission reactor.
**Reason (R):** Control rods absorb excess neutrons to prevent a runaway chain reaction.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**57.** The immense energy released during a nuclear reaction is a direct consequence of a small amount of mass converting into energy. Which famous equation governs this mass-energy equivalence?
(A) $F = G(m1m2/r^2)$
(B) $E = h\nu$
(C) $K = \frac{1}{2}mv^2$
(D) $E = mc^2$

**58.** The sun continually produces vast amounts of energy. Which specific nuclear process is responsible for the sun's energy generation?
(A) Fusion of hydrogen into helium
(B) Controlled fission of heavy uranium atomic nuclei
(C) Rapid spontaneous chemical combustion of hydrogen
(D) Natural radioactive alpha decay of radium isotopes

**59.** Consider the following statements regarding nuclear and thermal power generation:
I. A nuclear reactor moderator is used to slow down fast neutrons.
II. Rajasthan's only commercial nuclear power plant is located at Suratgarh.
III. Thermal power plants use coal combustion to create steam to turn turbines.
IV. Nuclear waste remains highly radioactive and requires specialized long-term disposal.
Which of the above statements is/are correct?
(A) I, II, and III only
(B) I, III, and IV only
(C) II, III, and IV only

Downloaded from www.pdf.tube

(D) I, II, III, and IV

**60.** A standard box-type solar cooker utilizes a transparent glass lid. What specific physical effect does this glass lid create to maximize cooking temperatures?
(A) The photovoltaic effect
(B) The greenhouse effect
(C) The thermoelectric effect
(D) Total internal reflection

**61.** Solar photovoltaic (PV) cells convert solar radiation directly into electrical energy. What semi-conducting material is predominantly used in the manufacturing of commercial solar cells?
(A) Silicon
(B) Copper
(C) Aluminum
(D) Germanium

**62.** Domestic solar water heaters commonly utilize natural fluid circulation without a pump. What is the fundamental principle behind this passive flow?
(A) Resonant electromagnetic induction principles
(B) Spontaneous capillary action inside tubes
(C) Thermosiphon effect via convection
(D) Differential osmotic pressure forces

**63.** At the $COP_{26}$ climate summit, India presented its 'Panchamrit' strategy. As part of this policy, what is India's target for non-fossil fuel energy capacity by the year 2030?
(A) 175 GW
(B) 300 GW
(C) 1000 GW
(D) 500 GW

**64.** To aggressively combat global climate change, India has officially pledged to achieve 'Net Zero' carbon emissions by which specific target year?
(A) 2030
(B) 2050
(C) 2070
(D) 2100

**65.** The International Solar Alliance (ISA) is a global initiative heavily championed by India to promote solar energy. Where is the official headquarters of the ISA located?
(A) New Delhi, India
(B) Gurugram, India
(C) Paris, France
(D) Geneva, Switzerland

**66.** Rajasthan hosts one of the largest solar parks in the world. What is the name of this massive solar park, which has a total capacity of 2245 MW?
(A) Pavagada Solar Park
(B) Kurnool Ultra Mega Solar Park
(C) Charanka Solar Park
(D) Bhadla Solar Park

**67.** Under the Rajasthan Solar Energy Policy 2019, the state government established an ambitious target for total solar power installation by the financial year 2024-25. What is this target capacity?
(A) 30 GW
(B) 10 GW
(C) 50 GW
(D) 100 GW

**68.** Wind energy potential in Rajasthan is highly concentrated in certain geographic zones. Which district in Rajasthan is the primary hub for major wind energy generation?
(A) Jaipur
(B) Udaipur
(C) Jaisalmer
(D) Kota

**69.** The PM-KUSUM scheme aims to provide energy security to farmers. The first solar power plant under Component-A of this scheme in India was successfully established in which village of Rajasthan?
(A) Bhaloji (Jaipur)
(B) Nokh (Jaisalmer)
(C) Gorir (Jhunjhunu)
(D) Rawatbhata (Chittorgarh)

NODIA

**70.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Rajasthan possesses the highest potential for solar power generation among all Indian states.
**Reason (R):** The state receives maximum direct normal irradiance (DNI) due to prolonged cloud-free days and extensive arid barren lands.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

**71.** India's first fully operational hybrid wind-solar power plant was commissioned by Adani Green Energy in which district of Rajasthan?
(A) Bikaner
(B) Jaisalmer
(C) Jodhpur
(D) Barmer

**72.** Which specific nodal agency in Rajasthan is directly responsible for coordinating and promoting the development of non-conventional energy sources in the state?
(A) Rajasthan Rajya Vidyut Prasaran Nigam (RVPN)
(B) Rajasthan State Industrial Development and Investment Corporation (RIICO)
(C) Rajasthan Renewable Energy Corporation Limited (RRECL)
(D) Rajasthan Electricity Regulatory Commission (RERC)

**73.** In the context of physics and engineering, how is the mechanical efficiency of any machine strictly defined?
(A) The combined numerical sum of useful work output and total energy input.
(B) The mathematical ratio of total energy input to useful work output.
(C) The absolute subtraction of dissipated heat lost from total work done.
(D) Ratio of useful energy output to total energy input.

**74.** According to fundamental thermodynamic principles, why can the mechanical efficiency of a real machine never reach exactly 100%?
(A) Some input energy is dissipated as heat and sound due to friction.
(B) Because physical machines are inherently imperfect and poorly constructed.
(C) Because energy is always completely destroyed during thermal transformation.
(D) Because the incoming electrical or mechanical input power fluctuates constantly.

**75.** In energy management and engineering, a Sankey diagram is frequently utilized. What does it visually represent?
(A) The exact molecular composition and atomic structure of fossil fuels.
(B) Energy flows and proportional losses within a system.
(C) The geographic distribution and density of renewable energy plants.
(D) The chronological geological history of fossil fuel formation.

**76.** The phenomenon commonly known as the 'Energy Crisis' refers to:
(A) The sudden and widespread destruction of global electrical power grids by solar flares.
(B) A severe shortage or bottleneck in energy resource supply to an economy.
(C) Uncontrolled overproduction of renewable energy causing severe regional grid failures.
(D) The historical economic transition from mechanical power to electrical power sources.

**77.** To manage energy demand efficiently, the Government of India enacted the pivotal Energy Conservation Act in which year?
(A) 1991
(B) 2001
(C) 2011
(D) 2021

**78.** When purchasing electrical appliances like air conditioners, consumers check the BEE Star Rating. What does a higher star rating strictly signify?
(A) The rated appliance consumes far more energy but operates significantly faster.
(B) The physical appliance is constructed to be significantly heavier and larger.
(C) The appliance is energy-efficient, using less power for equal output.
(D) The internal motor of the appliance operates exclusively on direct current (DC).

**79.** Sustainable development is a critical strategy to avoid energy crises. The widely accepted definition "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" originated from which report?
(A) The Kyoto Protocol
(B) The Paris Agreement
(C) The Earth Summit Agenda 21
(D) The Brundtland Report

**80.** Every thermodynamic heat engine operates using three basic components. What are these three essential elements?
(A) Chemical storage battery, electric driving motor, power generator
(B) Thermal evaporator, liquid condenser,

Click Here to Buy book on Amazon

mechanical gas compressor
(C) High-temperature source, low-temperature sink, working substance
(D) Reciprocating piston, engine crankshaft, electric spark plug unit

**81.** Internal combustion engines are broadly classified into spark-ignition and compression-ignition. Which standard ideal thermodynamic cycle closely models the operation of a conventional petrol engine?
(A) Carnot cycle
(B) Otto cycle
(C) Diesel cycle
(D) Rankine cycle

**82.** In a conventional diesel engine, what triggers the ignition of the fuel inside the combustion chamber?
(A) An electric arc from a high-voltage spark plug.
(B) A continuous open pilot flame inside the cylinder.
(C) Spontaneous chemical reaction with a catalyst.
(D) Heat generated by high compression of air.

**83.** Select the correct sequential order of the four strokes operating in a standard four-stroke internal combustion petrol engine.
(A) Compression, Power, Exhaust, Intake
(B) Intake, Compression, Power, Exhaust
(C) Intake, Power, Compression, Exhaust
(D) Power, Exhaust, Intake, Compression

**84.** The maximum possible theoretical efficiency of a heat engine operating between a source at absolute temperature $T_1$ and a sink at absolute temperature $T_2$ is given by the Carnot efficiency formula. Which formula is correct?
(A) $\eta = 1 - (T_1 / T_2)$
(B) $\eta = (T_1 - T_2) / (T_1 + T_2)$
(C) $\eta = 1 - (T_2 / T_1)$
(D) $\eta = T_2 / T_1$

**85.** A household refrigerator acts fundamentally as a reversed heat engine. What is the primary function of the compressor inside a refrigerator?
(A) Compresses refrigerant vapor, raising its temperature and pressure.
(B) To absorb thermal heat directly from stored food items inside the compartment.
(C) To rapidly decrease the operating pressure of the circulating liquid refrigerant.
(D) To continuously expel chilled cold air directly into the surrounding kitchen space.

**86.** The performance of a refrigerator or an air conditioner is not measured in standard efficiency but by another metric. What is this standard technical metric called?
(A) Overall Thermal Transmittance Index
(B) Specific Heat Capacity Metric Index
(C) Total entropy generation factor value
(D) Coefficient of Performance

**87.** Historically, Chlorofluorocarbons (CFCs) were widely used as refrigerants. Why have they been phased out globally in favor of HFCs and natural refrigerants?
(A) CFCs pose severe fire risks by being highly flammable inside residential homes.
(B) They contribute to stratospheric ozone layer depletion.
(C) CFCs fail to absorb sufficient latent heat required for effective freezing cycles.
(D) CFCs undergo rapid radioactive decay over time when exposed to sunlight.

**88.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Leaving the door of a running refrigerator open in a perfectly closed room will eventually heat up the room instead of cooling it.
**Reason (R):** A refrigerator exhausts more heat into the room through its condenser than it extracts from the room's air.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

NODIA

**89.** Electricity bills are calculated based on the commercial unit of electrical energy, the Kilowatt-hour (kWh). Exactly how many Joules are equivalent to 1 kWh?
(A) $3.6 \times 10^3$ Joules
(B) $3.6 \times 10^5$ Joules
(C) $3.6 \times 10^8$ Joules
(D) $3.6 \times 10^6$ Joules

**90.** The calorie is a widely recognized unit of thermal energy, especially in nutrition and thermodynamics. One standard calorie is equivalent to approximately how many Joules?
(A) 4.184 J
(B) 1.000 J
(C) 10.00 J
(D) 4184 J

**91.** In modern particle physics and nuclear physics, energy is often measured in electron-volts (eV). What does one electron-volt specifically represent?
(A) The mechanical force strictly required to move one single electron across a perfect vacuum.
(B) Kinetic energy gained by an electron accelerated through 1 volt.
(C) The total electrical charge carried by a single electron circulating in a closed loop.
(D) The overall electrical power consumed by a low-voltage circuit operating at one volt.

**92.** In the CGS system of units, energy is measured in ergs. What is the exact mathematical conversion factor between Joules and ergs?
(A) 1 Joule = $10^5$ ergs
(B) 1 Joule = $10^7$ ergs
(C) 1 erg = $10^7$ Joules
(D) 1 erg = $10^5$ Joules

**93.** Match List I with List II:
**List I: (Physical Quantity)**
P. Power
Q. Work
R. Temperature
S. Force
**List II: (Appropriate SI Unit)**
1. Joule
2. Watt
3. Newton
4. Kelvin
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**94.** The total amount of greenhouse gases generated heavily by an individual's, organization's, or product's actions is defined by which specific term?
(A) Carbon Sink
(B) Carbon Credit
(C) Carbon Footprint
(D) Net Carbon Balance

**95.** Among the following gases, which is the most abundant anthropogenic (human-caused) greenhouse gas responsible for modern global warming?
(A) Atmospheric Methane
(B) Nitrous Oxide gas
(C) Tropospheric Ozone
(D) Carbon Dioxide

**96.** The concept of 'Carbon Credits' was introduced globally to financially incentivize the reduction of carbon emissions. Under which international agreement was this formally operationalized?
(A) Montreal Protocol
(B) Geneva Convention
(C) Kyoto Protocol
(D) Vienna Convention

**97.** Consider the following statements about Green Hydrogen:
I. It is produced strictly via the electrolysis of water.
II. The electricity used in its production must come from renewable energy sources.
III. Burning green hydrogen releases significant amounts of $CO_2$.
IV. It is considered a cornerstone technology for deep industrial decarbonization.
Which of the above statements is/are correct?
(A) I, II, and IV only
(B) I and III only
(C) II, III, and IV only
(D) I, II, III, and IV

**98.** Consider the following regions of the electromagnetic spectrum:
I. X-rays
II. Infrared
III. Visible light
IV. Ultraviolet
Select the correct order arranged strictly in increasing order of their individual photon energy:
(A) I → IV → III → II
(B) II → III → IV → I
(C) III → II → IV → I
(D) IV → I → III → II

**99.** Consider the following statements regarding heat capacity parameters:
I. Molar specific heat is defined as the heat required to raise the temperature of one

Downloaded from www.pdf.tube

mole of a substance by 1 Kelvin.
II. The specific heat of a gas at constant pressure (Cp) is always greater than at constant volume (Cv).
III. Water has one of the lowest specific heat capacities among common liquids.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**100.** Consider the following scenarios involving mechanical work:
I. A person holding a heavy load on their head while standing perfectly still.
II. Pushing a highly resistant rigid wall that does not move.
III. The tension in a string doing work on a stone swinging in a uniform horizontal circle.
In which of the above cases is the mechanical work done equal to zero?
(A) I only
(B) II only
(C) I and III only
(D) I, II, and III

**101.** Consider the following statements about fossil fuels and their environmental impacts:
I. Complete combustion of coal releases entirely harmless gases.
II. Fly ash is a major atmospheric pollutant resulting from thermal power generation.
III. Oil spills in marine environments severely reduce dissolved oxygen levels for marine life.
IV. The extraction of natural gas can lead to the release of unburned fugitive methane.
Which of the above statements is/are correct?
(A) II, III, and IV only
(B) I, II, and III only
(C) III and IV only
(D) I, II, III, and IV

**102.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Aquatic life in deep frozen lakes manages to survive harsh winters without freezing entirely.
**Reason (R):** The anomalous expansion of water causes water at 4 °C to sink to the bottom, leaving an insulating layer of ice purely on the surface.
In the light of the above statements, choose the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**103.** Match List I with List II:
**List I: (Energy Transformation Device)**
P. Electric Motor
Q. Dynamo / Generator
R. Microphone
S. Loudspeaker
**List II: (Primary Function)**
1. Sound energy to Electrical energy
2. Electrical energy to Sound energy
3. Mechanical energy to Electrical energy
4. Electrical energy to Mechanical energy
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-3, R-2, S-1
(D) P-1, Q-2, R-3, S-4

NODIA

**104.** Match List I with List II:
**List I: (Renewable / Energy Project in Rajasthan)**
P. Bhadla Solar Park
Q. Rawatbhata Nuclear Power Plant
R. Amarsagar Wind Power Plant
S. Devgarh Wind Power Project
**List II: (Located District)**
1. Jaisalmer
2. Jodhpur
3. Chittorgarh
4. Pratapgarh
(A) P-2, Q-3, R-1, S-4
(B) P-1, Q-3, R-2, S-4
(C) P-2, Q-1, R-3, S-4
(D) P-2, Q-4, R-1, S-3

**105.** Select the correct order of temperature scales arranged by the numerical value of the freezing point of pure water, from highest numerical value to lowest.
(A) Kelvin, Fahrenheit, Celsius
(B) Fahrenheit, Kelvin, Celsius
(C) Celsius, Fahrenheit, Kelvin
(D) Kelvin, Celsius, Fahrenheit

**106.** Consider the following primary stages of the commercial nuclear fuel cycle:
I. Enrichment of Uranium isotopes

II. Geological mining and milling of Uranium ore
III. Generation of electricity within the reactor
IV. Safe geological disposal or reprocessing of spent fuel

Select the correct chronological order from the options given below:
(A) I → II → III → IV
(B) II → I → III → IV
(C) II → III → I → IV
(D) I → III → II → IV

**107.** Which foundational principle famously establishes that mechanical work can be completely converted into heat energy, symbolized universally by the constant 'J'?
(A) Mechanical equivalent of heat
(B) Bernoulli's principle
(C) The principle of superposition
(D) Archimedes' principle

**108.** An electric heater rated at 2000 Watts operates precisely for 5 hours every single day. How much electrical energy does it consume in a 30-day month?
(A) 100 kWh
(B) 600 kWh
(C) 300 kWh
(D) 3000 kWh

**109.** The global atmospheric circulation patterns, particularly the trade winds, are essentially grand-scale naturally occurring examples of which heat transfer phenomenon?
(A) Thermal conduction
(B) Radiative forcing
(C) Latent heat exchange
(D) Convection

**110.** An ideal 'black body' in the context of thermal radiation possesses which of the following defining optical properties?
(A) It perfectly reflects all incident thermal electromagnetic radiation completely.
(B) It transmits 100% of incident visible light without any physical absorption.
(C) It absorbs all incident electromagnetic radiation of any frequency.
(D) It selectively absorbs electromagnetic radiation strictly in the visible light spectrum.

**111.** The thermal process of gasification transforms solid biomass into a highly combustible synthetic gas blend. What is this resulting combustible gas mixture commonly called?
(A) Liquefied Petroleum Gas (LPG)
(B) Syngas (Synthesis Gas)
(C) Compressed Natural Gas (CNG)
(D) Biogas

**112.** Geothermal energy harnesses the tremendous thermal power naturally originating from where?
(A) The gravitational tidal pull exerted continuously by the moon.
(B) The continuous radiant heat emitted by the sun onto the earth's crust.
(C) The surface friction caused by atmospheric wind blowing over mountains.
(D) Radioactive decay and residual heat within Earth's mantle.

**113.** Tidal energy is largely classified as a predictable renewable energy source. The immense energy of ocean tides is fundamentally driven by what force?
(A) Gravitational pull exerted by the Moon and Sun on Earth.
(B) Geothermal activity from underwater submarine volcanic eruptions.
(C) Rapid oceanic current variations driven by deep salinity differences.
(D) Large-scale thermal expansion of surface ocean water at the equator.

**114.** A mass attached to a horizontal frictionless spring exhibits simple harmonic motion. During its cycle, when the mass passes exactly through the equilibrium point, which energy statement is true?
(A) Elastic potential energy reaches its maximum value.
(B) Kinetic energy momentarily drops strictly to zero.
(C) Kinetic energy is at its maximum.
(D) Total mechanical energy momentarily drops to zero.

**115.** Newton's Law of Cooling accurately predicts the rate at which an exposed hot object cools. According to this law, the cooling rate is directly proportional to what parameter?
(A) The temperature difference between the object and surroundings.
(B) The total physical mass and overall volume of the hot cooling object.
(C) The total overall volume of the ambient surrounding atmospheric air.

Click Here to Buy book on Flipkart

(D) The specific heat capacity value of the immediate surrounding room.

**116.** Ocean Thermal Energy Conversion (OTEC) power plants require a specific temperature gradient to operate functionally. Roughly what minimum temperature difference is required between warm surface water and deep cold water?
(A) 5 °C
(B) 20 °C
(C) 50 °C
(D) 100 °C

**117.** Consider the following statements regarding the workings of basic heat engines:
I. A petrol engine uses a spark plug to ignite the fuel-air mixture.
II. A diesel engine compresses pure air and then injects fuel.
III. The Carnot cycle describes the realistic performance of everyday automobile engines.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**118.** When an ice cube initially at 0 °C melts entirely into liquid water at 0 °C, how does the internal energy of the $H_2O$ molecules fundamentally change?
(A) It decreases severely because liquid water is significantly denser than ice.
(B) It remains mathematically unchanged because system temperature stays constant.
(C) It increases due to absorption of latent heat of fusion.
(D) It fluctuates unpredictably depending on surrounding atmospheric air pressure.

**119.** A worker pushes a heavy crate up a rough inclined plane at a perfectly constant speed. Which fundamental work-energy statement best describes this process?
(A) The total kinetic energy of the crate is continuously and constantly increasing.
(B) No net gravitational work is performed against the downward force of gravity.
(C) The mechanical work done by sliding friction force is strictly positive.
(D) Net work done on the crate by external forces is zero.

**120.** During the process of nuclear fusion in the sun, four hydrogen nuclei eventually fuse to form one helium nucleus. Why does this exact reaction release such massive amounts of energy?
(A) The mass of helium is slightly less than hydrogen inputs, converting lost mass into energy.
(B) Helium nuclei produced in the core spontaneously decay into highly radioactive unstable isotopes.
(C) The nuclear reaction requires immense energy input from external surrounding cosmic rays to ignite.
(D) The hydrogen atoms lose all their orbit electrons, releasing massive amounts of electrical power.

NODIA

**121.** The phenomenon of 'regelation' is a classic demonstration of the physical effect of pressure on phase changes. Regelation refers directly to:
(A) The sudden and rapid boiling of liquids occurring under extremely low atmospheric pressure conditions.
(B) Ice melting under pressure and refreezing when pressure is released.
(C) The rapid direct sublimation of solid dry ice into a gaseous state under room temperature.
(D) The thermodynamic expansion of atmospheric water vapor when rapidly condensing into liquid.

**122.** Consider the following statements on solar technology efficiency:
I. The efficiency of a standard silicon solar cell significantly drops as its operating temperature increases.
II. Dust accumulation on a solar panel severely impedes photovoltaic output.
III. Concentrated solar power (CSP) heavily uses mirrors or lenses to focus sunlight onto a small area.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**123.** High energy particle accelerators frequently use the 'MeV' unit. What does the prefix 'M' mathematically denote in the term MeV (Mega electron-volt)?
(A) $10^3$
(B) $10^6$
(C) $10^9$

(D) $10^{12}$

**124.** Consider the following statements on power and energy in practical devices:
I. A 60W LED bulb consumes less electrical energy in one hour than a 60W incandescent bulb.
II. The energy stored in a fully charged battery is primarily chemical potential energy.
III. Transformers only step up or step down AC voltage and do not legally generate new power.
IV. Inverters physically transform direct current (DC) into alternating current (AC).
Which of the above statements is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

**125.** The process of converting solid carbon directly into gas without passing through a visible liquid phase is physically termed:
(A) Vaporization
(B) Condensation
(C) Deposition
(D) Sublimation

**126.** If the temperature of an ideal gas enclosed in a highly rigid container is doubled, what necessarily happens to the average kinetic energy of its gas molecules?
(A) It remains the same due to constant volume.
(B) It halves.
(C) It precisely doubles.
(D) It increases by a factor of exactly four.

**127.** Which principle primarily governs the functional design of high-altitude cooking devices like pressure cookers?
(A) Decreased ambient pressure radically lowers the specific heat capacity of liquid water.
(B) Increased pressure raises the boiling point of water.
(C) High internal pressure actively prevents rapid thermal conduction through metal walls.
(D) High pressure inside the vessel physically forces water steam to undergo phase fusion.

**128.** An object of mass 5 kg is dropped continuously from a height of 20 m. Ignoring air resistance, what will its exact kinetic energy be right before it hits the ground? ($g = 10\ m/s^2$)
(A) 500 J
(B) 100 J
(C) 250 J
(D) 1000 J

**129.** The Rajasthan government frequently introduces policies for robust energy generation. Which prominent policy specifically targets the extensive utilization of agricultural waste for stable power generation?
(A) Rajasthan Biomass Energy Policy
(B) Rajasthan Wind and Hybrid Energy Policy
(C) Rajasthan Solar Energy Policy
(D) PM-KUSUM Scheme Component C

NODIA

**130.** A device lifts a 50 kg mass vertically upward by strictly 2 meters in precisely 10 seconds. What is the approximate average power forcefully developed by the device? ($g = 10\ m/s^2$)
(A) 1000 W
(B) 500 W
(C) 100 W
(D) 250 W

**131.** The physical unit 'Joule per Second' perfectly corresponds to which fundamental physical quantity?
(A) Power
(B) Electrical Resistance
(C) Energy
(D) Work

**132.** Among various power plant designs, which specific type inherently involves the minimum recurring running/fuel cost over its vast operational lifespan?
(A) Commercial Nuclear Power Plant
(B) Coal-fired Thermal Power Plant
(C) Internal Diesel Generator Plant
(D) Hydroelectric Plant

**133.** When measuring engine efficiency, 'brake horsepower' is a critical metric. What does brake horsepower rigorously measure?
(A) The absolute total thermal power strictly absorbed by the internal cooling system.
(B) Usable power delivered at the engine crankshaft.
(C) The total wasted thermal power heavily lost directly through the engine exhaust pipe.
(D) The maximum theoretical thermodynamic power based purely on chemical fuel combustion.

**134.** Which phenomenon inherently causes a glass tumbler to physically crack when forcefully poured with boiling hot water?
(A) A rapid violent chemical reaction occurring spontaneously between glass and water.
(B) The sudden anomalous volumetric thermal expansion of the poured hot water.
(C) Uneven thermal expansion between inner and outer glass surfaces.
(D) The drastic physical lowering of the solid glass's latent heat of fusion.

**135.** Consider the following statements regarding specific heat:
I. Specific heat capacity strictly dictates how fast a material can conduct heat.
II. A material with incredibly high specific heat requires substantial energy to raise its temperature.
III. Water efficiently moderates coastal climates directly due to its very high specific heat.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**136.** Consider a perfectly elastic bouncing ball. When the ball severely compresses upon forcefully hitting the ground, its primary kinetic energy is temporarily stored mainly as:
(A) Elastic potential energy
(B) Gravitational potential energy
(C) Chemical potential energy
(D) Thermal radiation

**137.** During extremely cold winter nights, frost easily forms precisely on the windshield of a deeply parked car despite the ambient air temperature being slightly above freezing. What is the primary heat loss mechanism responsible for this chilling?
(A) Continuous latent heat release process
(B) Radiative cooling to the clear sky
(C) Thermal conduction to surrounding cold air
(D) Vigorous atmospheric convection currents

**138.** Modern wind turbines physically utilize three giant aerodynamic blades. What fundamental design consideration drives this three-blade standard rather than purely using two or four?
(A) It strictly prevents all aerodynamic and mechanical acoustic noise generation during operation.
(B) Optimal balance of aerodynamic efficiency, structural stability, and cost.
(C) It legally ensures that the rotating turbine blade tips travel faster than the speed of sound.
(D) It inherently and completely prevents avian bird strikes from occurring around the tower.

**139.** In highly specialized low-temperature physics, what specific substance acts as an exceptional cryogenic refrigerant due strictly to its boiling point of merely 4.2 K?
(A) Liquid Helium
(B) Liquid Nitrogen
(C) Liquid Oxygen
(D) Liquid Hydrogen

**140.** Consider the following statements regarding carbon emission reduction:
I. Carbon offsets perfectly erase the strict physical existence of emitted $CO_2$ molecules.
II. Widespread adoption of electric vehicles directly reduces strict tailpipe emissions drastically.
III. Afforestation legally creates strong carbon sinks that absorb massive atmospheric $CO_2$.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

www.nodia.in

Downloaded from www.pdf.tube

# ANSWERS

**1.** (B) Temperature is a measure of the average kinetic energy of molecules, while heat is the total energy transferred due to a temperature difference.
Thermal energy dynamics involve distinct macroscopic and microscopic definitions. Temperature quantifies the average kinetic energy of constituent particles within a system, establishing a thermal state independent of mass. Heat represents thermal energy in transit across a boundary solely driven by a temperature gradient, resulting in net energy transfer between systems until thermal equilibrium is achieved.

**2.** (D) Both bodies are at the exact same temperature.
Thermal equilibrium occurs when two interacting physical bodies attain equal macroscopic temperatures. When two systems in thermal contact reach identical temperatures, the net exchange of heat energy between them becomes zero. At this state, microscopic energy exchanges during collisions continue equally in both directions, establishing thermal balance without any continuous macroscopically measurable net heat transfer.

**3.** (A) It depends on the amount of matter present in the system.
Thermodynamic properties are categorized as either intensive or extensive depending on mass dependence. Heat represents the total thermal energy transferred, which directly scales with the total mass and quantity of substance present within a system. Because the amount of energy absorbed or released depends directly on physical quantity, heat is classified as an extensive thermodynamic property.

**4.** (C) -273.15 °C
Absolute zero represents the lowest fundamental thermodynamic temperature limit at which enthalpy and entropy of a cooled ideal gas reach minimum physical values. On the Kelvin absolute scale, this state corresponds to zero Kelvin. Expressed on the Celsius temperature scale, absolute zero is precisely defined as negative two hundred seventy-three point one five degrees Celsius.

**5.** (A) 37.0 °C
Converting thermal values between Fahrenheit and Celsius scales utilizes a standard linear conversion equation. The mathematical relation subtracts thirty-two from the Fahrenheit reading and multiplies the remaining quantity by five-ninths. Applying this formula to a human body temperature of ninety-eight point six degrees Fahrenheit yields a calculated equivalent value of exactly thirty-seven point zero degrees Celsius.

**6.** (D) -40°
Temperature conversion between Celsius and Fahrenheit scales relies on the linear relationship defined by the standard algebraic formula. Equating both temperature variables allows determination of the unique point where numerical values become equal. Solving this dynamic mathematical equation demonstrates that minus forty degrees Celsius corresponds precisely to minus forty degrees Fahrenheit on both thermometric scales.

**7.** (B) It does not have any negative values and starts at absolute zero.
The Kelvin temperature scale functions as an absolute thermodynamic scale because its numerical origin is fixed at absolute zero, the theoretical point of minimal molecular kinetic motion. Consequently, temperatures on the Kelvin scale are non-negative real numbers, eliminating negative values and facilitating direct proportion calculations in thermodynamic laws and physical equations.

**8.** (A) P-4, Q-2, R-1, S-3
Standard physical reference points provide fixed baseline values across thermometric measurement systems. On the Celsius scale, pure water boils at one hundred degrees under standard atmospheric pressure. Pure water freezes at thirty-two degrees Fahrenheit, while absolute zero corresponds to zero Kelvin. Furthermore, normal human body temperature is recognized standardly as ninety-eight point six degrees Fahrenheit.

NODIA

**9.** (D) The state where ice, liquid water, and water vapor coexist in thermal equilibrium.
The triple point of water represents a unique thermodynamic state defined by specific pressure and temperature conditions. At this singular point, the three phases of water—solid ice, liquid water, and gaseous water vapor—coexist simultaneously in stable thermodynamic equilibrium. This stable state serves as an essential invariant reference point for defining absolute temperature scales.

**10.** (A) Presence of free electrons that rapidly transport thermal energy.
Metallic conduction of heat occurs through lattice vibrations and free electron transport. In solid metals, delocalized valence electrons move freely throughout the crystal lattice, gaining kinetic energy from hotter regions and rapidly transferring it to cooler regions through collisions. This rapid electronic thermal conduction makes metals far superior thermal conductors compared to non-metallic solids.

**11.** (B) Radiation
Thermal energy transfer through electromagnetic waves is defined as thermal radiation. Unlike conduction and convection, which depend entirely on atomic vibrations or fluid movement through physical media, electromagnetic waves propagate across space. Therefore, thermal radiation represents the only heat transfer mechanism capable of transmitting energy efficiently through a complete vacuum without requiring intermediate material media.

**12.** (B) Differences in density caused by temperature variations.
Natural convection in fluids operates through density variations generated by thermal expansion. Heating a fluid region decreases its localized density, causing the warmer fluid to rise buoyantly while denser, cooler fluid sinks under gravity. This continuous movement establishes convective currents, continuously redistributing thermal energy throughout the bulk liquid or gaseous medium.

**13.** (A) It prevents both conduction and convection.
A vacuum flask utilizes a double-walled vessel with evacuated space between the walls to minimize thermal dissipation. Conduction and convection both strictly require a material medium containing physical particles to transport kinetic energy. Removing air from the intermediate space eliminates conduction and convection across the barrier, leaving thermal radiation as the only remaining pathway for energy transfer.

**14.** (B) II and III only
Heat transfer mechanisms operate under distinct physical principles. Thermal radiation consists of electromagnetic waves traveling through space at the speed of light. Convection involves fluid displacement and drives atmospheric weather systems, whereas conduction occurs through atomic vibrations without bulk material motion. Consequently, thermal radiation speed and convective atmospheric mechanisms represent valid phenomena, while fluid bulk movement defines convection rather than conduction.

**15.** (D) Convection
Sea breezes during daylight hours are driven by differential surface heating between land and ocean bodies. Land absorbs solar radiation and heats faster than water, causing the air above land to expand, lose density, and rise. Cooler, denser air over the water moves inland to replace the rising warm air, establishing a natural convective current.

**16.** (C) The heat required to raise the temperature of 1 kg of a substance by 1 °C.
Specific heat capacity measures the intrinsic capability of a substance to store thermal energy per unit mass. It is quantitatively defined as the precise quantity of heat energy needed to elevate the temperature of a one-kilogram mass of a given material by one degree Celsius or Kelvin, reflecting how resistant the material is to thermal change.

**17.** (B) High specific heat capacity
Liquid water possesses a high specific heat capacity of approximately four thousand one hundred eighty-four joules per kilogram per degree Celsius. This property enables water to absorb substantial quantities of thermal energy while experiencing only a modest increase in temperature, making it exceptionally effective as a coolant for preventing engine overheating in internal combustion systems.

**18.** (D) 84,000 J
Heat energy transferred during temperature changes is calculated using the product of

Click Here to Buy book on Amazon

mass, specific heat capacity, and temperature change. Multiplying a mass of two kilograms by a specific heat capacity of four thousand two hundred joules per kilogram degree Celsius and a temperature increase of ten degrees Celsius yields a total heat energy requirement of eighty-four thousand joules.

**19.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Desert regions experience extreme diurnal temperature fluctuations due to soil physical properties. Sand exhibits a low specific heat capacity, meaning minimal heat energy causes rapid temperature elevation during sunlight hours, while quick heat loss produces drastic cooling at night. This low specific heat directly explains why desert environments undergo severe diurnal temperature swings between day and night.

**20.** (C) Latent heat of fusion
Phase transitions between solid and liquid states occur at constant temperature under uniform pressure. The thermal energy absorbed or released strictly during melting or freezing without changing temperature is defined as the latent heat of fusion. This energy breaks or forms structural lattice bonds within the substance without altering particle kinetic energy or macroscopic temperature.

**21.** (A) It overcomes intermolecular forces to change the physical state.
During phase change at constant temperature, thermal energy input does not increase molecular kinetic energy. When water reaches its boiling point, added heat supplies potential energy needed to overcome attractive intermolecular forces holding molecules in liquid phase. This energy separates liquid molecules into high-energy gaseous phase molecules without changing system temperature during vaporization.

**22.** (D) Steam releases additional latent heat of vaporization upon condensation.
Thermal burn severity depends on the total energy transferred to skin tissue. Gaseous steam at one hundred degrees Celsius contains extra thermal energy compared to boiling water at the same temperature. Upon contacting skin, steam condenses into liquid water, releasing its latent heat of vaporization before cooling, resulting in significantly greater energy transfer and injury.

**23.** (B) $22.6 \times 10^5$ J/kg
Latent heat of vaporization quantifies the thermal energy absorbed per unit mass during phase transition from liquid to gas at boiling temperature. For pure water at standard atmospheric pressure, this value is approximately two point two six times ten to the power of six joules per kilogram, reflecting strong hydrogen bonding between liquid molecules.

**24.** (C) IV only
Thermal expansion dynamics describe volume and dimensional changes across temperature shifts. Most materials expand upon heating, whereas water contracts between zero and four degrees Celsius. Volume expansion coefficients equal three times linear coefficients. However, bimetallic strips bend specifically because their component metals possess unequal expansion coefficients, making identical expansion rates incorrect regarding bimetallic strip bending behavior.

NODIA

**25.** (D) 4 °C
Pure water displays anomalous thermal expansion behavior between zero and four degrees Celsius. Heating ice-cold water from zero degrees Celsius breaks open hydrogen-bonded ring structures, causing volume contraction and density elevation until reaching maximum density at four degrees Celsius. Above four degrees, standard thermal expansion dominates, causing density to decrease with further temperature increases.

**26.** (A) To allow thermal expansion of rails during hot weather.
Solid iron tracks undergo linear expansion when exposed to elevated summer temperatures and friction. Leaving small expansion gaps between successive rails provides space for structural elongation without creating compressive stress. Without these deliberate gaps, thermal expansion forces would cause physical buckling, warping, and dangerous structural derailment hazards along the railway line.

**27.** (B) Zeroth Law
The Zeroth Law of Thermodynamics establishes the fundamental physical concept of thermal equilibrium. It states that if two separate systems are each in thermal equilibrium with a third system, they are in thermal equilibrium with each other. This property allows definition

**48.** (C) 746 W
Horsepower serves as a traditional unit of mechanical power widely applied in automotive and industrial engineering. One mechanical horsepower is defined based on imperial lifting capacity standards, where one mechanical horsepower converts precisely to approximately seven hundred forty-six Watts in standard metric power units, facilitating electrical power comparisons.

**49.** (B) Natural gas
Non-renewable energy resources are exhaustible assets that form over geological timescales faster than natural replenishment rates. Natural gas consists predominantly of fossilized hydrocarbons created over millions of years. Once extracted and combusted, natural gas reserves cannot be naturally replenished within human timeframes, defining natural gas as a non-renewable fuel.

**50.** (D) Methane
Biogas is generated through anaerobic digestion, a biological process where microorganisms decompose organic biomass materials like agricultural waste or manure without oxygen. The predominant combustible gaseous product formed during anaerobic fermentation is methane gas, comprising fifty to seventy percent of total volume, making methane the primary active fuel.

**51.** (A) II → I → IV → III
Hydroelectric generation converts elevated water energy into electricity sequentially. Water stored in high reservoirs possesses gravitational potential energy. Released water flowing down penstocks converts potential energy into kinetic energy of moving fluid. This kinetic fluid strikes hydraulic turbines, generating rotational mechanical energy, which drives electromagnetic generators to produce output electricity.

**52.** (C) 15 km/h
Commercial wind turbine generators require minimum threshold wind velocities to overcome rotational mechanical inertia and generate viable electrical output. A sustained wind speed of approximately fifteen kilometers per hour serves as the standard cut-in wind speed necessary to initiate efficient rotational motion and commercial power generation across modern wind farms.

**53.** (B) Peat, Lignite, Bituminous, Anthracite
Coal types reflect stages of geological carbon concentration through heat and pressure over time. Peat represents initial organic stage with lowest carbon percentage, followed by brown lignite coal. Soft bituminous coal contains higher carbon concentration, while hard anthracite represents highest metamorphic rank, containing over ninety percent pure carbon content.

**54.** (C) III only
Fossil fuel combustion impacts the atmosphere differently depending on hydrocarbon structure. Fractional distillation separates crude oil into fractions, while coal combustion releases sulfur oxides causing acid rain. Natural gas consists mainly of methane, burning far cleaner than coal and producing minimal carbon particulate emissions, making statements praising gas cleanliness accurate.

**55.** (B) Nuclear fission
Commercial nuclear power reactors rely on controlled nuclear fission processes. In fission, heavy fissile nuclei like uranium-two hundred thirty-five absorb thermal neutrons and split into lighter fission fragments, releasing high-energy neutrons and thermal energy. Heat generated from controlled fission converts water to steam, driving turbines to generate electricity.

**56.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Control rods are essential reactor components made of neutron-absorbing materials such as cadmium or boron. In fission reactions, neutron multiplication must be carefully managed. Control rods are inserted into or withdrawn from reactor cores to absorb excess thermal neutrons, regulating fission reaction rates and preventing dangerous uncontrolled runaway power spikes.

**57.** (D) $E = mc^2$
Albert Einstein formulated mass-energy equivalence, establishing that mass and energy represent unified physical quantities. The governing equation states energy equals mass multiplied by speed of light squared. During nuclear reactions, a tiny mass defect converts into immense thermal energy, explaining energy production in nuclear fission reactors and stellar fusion.

Downloaded from www.pdf.tube

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

requiring vector addition components or directional parameters.

**38.** (D) Remains constant, though it may change forms.
The principle of conservation of energy states that energy within an isolated system cannot be created or destroyed. While energy frequently undergoes transformation between various mechanical, thermal, electrical, and chemical forms, the total quantitative energy sum across all forms within an isolated boundary remains strictly constant over time throughout any process.

**39.** (B) $K = p^2 / (2m)$
Kinetic energy equals half mass times velocity squared, while momentum equals mass times velocity. Expressing velocity in terms of momentum over mass and substituting into the kinetic energy equation yields kinetic energy equal to squared momentum divided by twice the object mass, establishing the mathematical relationship linking linear momentum and kinetic energy.

**40.** (C) It quadruples (by a factor of 4).
Kinetic energy is directly proportional to mass and the square of velocity. Because velocity enters the kinetic energy equation as a squared term, doubling the velocity of an object increases velocity squared by a factor of four. Assuming constant mass, doubling vehicle speed quadruples total kinetic energy required or possessed.

**41.** (D) 490 J
Gravitational potential energy stored in an elevated mass equals the product of mass, gravitational acceleration, and height above reference level. Multiplying a mass of ten kilograms, gravitational acceleration of nine point eight meters per second squared, and height of five meters yields four hundred ninety Joules of potential energy stored.

**42.** (C) Assertion (A) is true but Reason (R) is false.
The Work-Energy Theorem dictates that net work performed by forces on a body equals change in kinetic energy. Work against conservative forces like gravity stores mechanical energy as potential energy rather than losing it. Therefore, work performed on objects equals kinetic energy change, but conservative work conserves total mechanical energy.

**43.** (B) Kinetic energy is maximum, potential energy is minimum.
Oscillating simple pendulums continuously convert mechanical energy between kinetic and gravitational potential forms. At the lowest central position of oscillation, vertical height relative to reference baseline reaches minimum, causing potential energy to reach minimum. Simultaneously, speed reaches maximum magnitude, resulting in peak kinetic energy at the mean position.

**44.** (B) Gravitational force
A simple pendulum swings along a circular arc under gravity. The gravitational weight force acts downward, resolving into components along and perpendicular to the arc path. The tangential component of gravity opposes angular displacement, providing the necessary restoring force that continuously pulls the swinging pendulum bob toward equilibrium position.

**45.** (D) I, II, and III
Objects in free fall inside a vacuum experience constant downward acceleration due to gravity. Descending height causes gravitational potential energy to decrease continuously, while increasing downward velocity increases kinetic energy proportionally. Because conservative gravitational forces act without dissipative drag, the total mechanical energy sum remains completely constant throughout descent.

**46.** (C) $P = F \times v$
Mechanical power represents time rate of doing work. Work equals force multiplied by displacement in direction of motion. Dividing displacement by time yields linear velocity. Consequently, instantaneous mechanical power delivered by force acting on moving objects equals scalar product of force vector and velocity vector, simplified to force times velocity.

**47.** (D) 100 W
Mechanical power measures the rate of energy conversion or work done per unit time. Convert time duration from one minute to sixty seconds. Dividing work performed of six thousand Joules by time interval of sixty seconds gives power output equal to one hundred Watts, representing one hundred Joules per second.

NODIA

units, establishing foundational physical concepts leading to energy conservation laws.

**108.** (C) 300 kWh
Electrical energy consumption equals power rating multiplied by total operating time. Operating a two-kilowatt heater for five hours daily yields ten kilowatt-hours of electrical energy per day. Over a thirty-day monthly billing cycle, multiplying daily energy by thirty days results in three hundred kilowatt-hours of total electrical energy consumed.

**109.** (D) Convection
Planetary atmospheric wind circulation systems, such as trade winds, are driven by natural convection on a global scale. Equatorial atmospheric air absorbs intense solar radiation, expands, decreases in density, and rises. Cooler, denser air from subtropical latitudes flows toward the equator to replace rising air masses, establishing continuous planetary convective currents.

**110.** (C) It absorbs all incident electromagnetic radiation of any frequency.
An ideal black body represents a theoretical thermodynamic radiator and absorber. Defined by complete absorption properties, a black body absorbs one hundred percent of all incident electromagnetic radiation across all wavelengths and angles without reflection or transmission, while simultaneously acting as an ideal thermal emitter at any given temperature.

**111.** (B) Syngas (Synthesis Gas)
Biomass gasification involves thermo-chemical conversion of carbonaceous materials at high elevated temperatures with controlled limited oxygen or steam. This process converts solid biomass into a combustible gaseous fuel mixture called synthesis gas, or syngas, composed primarily of carbon monoxide, hydrogen, and methane, useful for power generation or chemical synthesis.

**112.** (D) Radioactive decay and residual heat within Earth's mantle.
Geothermal energy originates from natural internal thermal energy stored beneath Earth's crust. Primary heat generation stems from the continuous radioactive decay of long-lived unstable isotopes like uranium, thorium, and potassium within Earth's mantle and core, supplemented by residual thermal energy remaining from planetary accretion during initial Earth formation.

**113.** (A) Gravitational pull exerted by the Moon and Sun on Earth.
Tidal energy harnesses predictable ocean water oscillations caused by celestial mechanics. Differential gravitational forces exerted primarily by the Moon and secondarily by the Sun act on Earth's oceans, producing periodic oceanic water bulges. The kinetic and potential energy of moving tidal waters drives hydraulic turbines to generate clean electricity.

**114.** (C) Kinetic energy is at its maximum.
In simple harmonic motion of a spring-mass system, total mechanical energy shifts between elastic potential energy and kinetic energy. At the central equilibrium position, spring displacement is zero, causing potential energy to drop to zero. Consequently, all mechanical energy converts to kinetic energy, making velocity and kinetic energy maximum.

**115.** (A) The temperature difference between the object and surroundings.
Newton's Law of Cooling states that the rate of thermal energy loss from a hot cooling body is directly proportional to the temperature difference between the object and its immediate surrounding environment, provided the temperature difference remains relatively small and heat loss occurs predominantly through steady natural convection and surface radiation.

**116.** (B) 20 °C
Ocean Thermal Energy Conversion power systems harness thermal gradients between warm surface ocean water and deep cold ocean water to drive thermodynamic cycles. Operable OTEC systems require a minimum temperature differential of approximately twenty degrees Celsius between surface water and ocean depths to run low-boiling working fluid thermodynamic turbines efficiently.

**117.** (A) I and II only
Spark-ignition petrol engines utilize spark plugs to ignite fuel-air mixtures, whereas diesel engines compress air to high temperatures before injecting fuel for compression ignition. Theoretical Carnot cycles describe idealized maximum thermodynamic limits rather than

Click Here to Buy book on Flipkart

**58.** (A) Fusion of hydrogen into helium
Stellar energy production in the sun relies on continuous thermonuclear fusion. At extreme core temperatures and pressures, hydrogen nuclei undergo the proton-proton chain reaction, fusing together to form stable helium nuclei. Mass lost during hydrogen fusion converts into massive radiation energy, sustaining solar output across billions of years.

**59.** (B) I, III, and IV only
Nuclear and thermal power systems follow distinct operational principles. Moderators slow fast neutrons to sustain controlled nuclear fission, while thermal plants burn coal generating steam for turbines. Radioactive nuclear waste requires long-term containment. Rajasthan's commercial nuclear facility is situated at Rawatbhata rather than Suratgarh, making statement two incorrect.

**60.** (B) The greenhouse effect
Standard box solar cookers utilize transparent glass covers to trap thermal radiation effectively. High-frequency solar rays pass through glass and heat internal black surfaces. Re-emitted long-wavelength infrared radiation cannot escape through glass easily. This trapped thermal energy causes internal temperatures to rise steadily, demonstrating the practical solar greenhouse effect.

**61.** (A) Silicon
Photovoltaic solar cells convert radiant light energy directly into DC electricity via electron excitation. Crystalline silicon serves as the predominant semiconductor material used in commercial solar panels due to suitable bandgap energy, long-term chemical stability, abundant raw material availability, and established manufacturing infrastructure across solar manufacturing industries globally.

**62.** (C) Thermosiphon effect via convection
Passive solar water heaters circulate fluid without mechanical pumps using thermosiphon convection principles. Water inside solar collector tubes absorbs thermal energy, expands, and decreases in density. Warm less-dense water naturally rises into the elevated storage tank, while cooler denser water flows downward to collectors, sustaining continuous fluid circulation.

**63.** (D) 500 GW
India committed to expanded renewable capacity targets under the Panchamrit strategy presented at $COP_{26}$. To accelerate climate action and decarbonization, India set an official national target to install five hundred gigawatts of non-fossil fuel electricity generation capacity by the year twenty thirty, expanding solar, wind, and hydro capabilities.

**64.** (C) 2070
At the $COP_{26}$ climate conference, India established long-term emissions mitigation goals to combat global warming. India officially pledged to reach Net Zero carbon emissions by twenty seventy. Achieving this long-term objective involves transitioning energy grids to renewables, enhancing industrial energy efficiency, and promoting electric mobility and green hydrogen technologies.

**65.** (B) Gurugram, India
The International Solar Alliance represents a collaborative treaty-based intergovernmental organization launched jointly by India and France to accelerate solar energy adoption across sunshine-rich nations. The official international headquarters and global secretariat of the alliance are established at Gurugram in Haryana, India, driving solar technology deployment, sustainable financing, and capacity building across member states.

**66.** (D) Bhadla Solar Park
Bhadla Solar Park, situated in Jodhpur district of Rajasthan, represents one of the largest operational solar power installations globally. Spanning over thousands of acres in arid desert terrain, the park reaches a total capacity of two thousand two hundred forty-five megawatts, significantly augmenting utility-scale clean electricity generation across regional and national power grids.

**67.** (A) 30 GW
The Rajasthan Solar Energy Policy 2019 was enacted to harness extensive solar irradiation potential across desert districts. Under this framework policy, the state government of Rajasthan established a target to achieve thirty gigawatts of total installed solar power generation capacity by the end of financial year twenty twenty-four to twenty-five.

Downloaded from www.pdf.tube

and operational calibration of temperature using thermometers as quantitative measuring devices.

**28.** (B) Law of conservation of energy
The First Law of Thermodynamics extends energy conservation principles to thermal systems. It dictates that net thermal energy added to a system equals the sum of the increase in internal energy and external work performed by the system. Consequently, energy cannot be created or destroyed, only transformed between thermal, mechanical, and internal forms.

**29.** (A) Converting heat completely into work in a cycle without heat rejection.
The Second Law of Thermodynamics establishes directional limits on heat engine operations. According to the Kelvin-Planck statement, no thermodynamic cycle can absorb thermal energy from a single reservoir and convert that heat completely into net work without rejecting heat to a cooler reservoir, ruling out one hundred percent thermodynamic efficiency in heat engines.

**30.** (A) P-4, Q-1, R-2, S-3
Thermodynamic processes are systematically classified according to specific physical parameters held constant during state changes. Isothermal processes maintain constant system temperature, while isobaric processes occur under constant pressure conditions. Isochoric processes take place at constant system volume, and adiabatic processes are defined by zero net heat exchange across the system boundary throughout the path.

**31.** (D) $W = F \times d \times \cos(\theta)$
Mechanical work performed by a constant force is scalar and defined as the dot product of force vector and displacement vector. Mathematically, work equals the magnitude of applied force multiplied by displacement magnitude and the cosine of the angle between force direction and displacement vector, accounting for effective directional force components.

**32.** (C) The angle between gravitational force and displacement is 90 degrees.
Gravitational work depends on displacement relative to vertical force lines. Gravitational force acts downward toward Earth's center. When an individual carries an object horizontally, displacement occurs perpendicular to gravity, creating a ninety-degree angle between force and motion. Since cosine of ninety degrees equals zero, net gravitational work done equals zero.

**33.** (B) 100 J
Mechanical work performed when force aligns with displacement equals the direct numerical product of force magnitude and displacement distance. Multiplying an applied force of twenty Newtons by a displacement of five meters along the direction of applied force yields one hundred Joules, as cosine of zero degrees equals one in work calculations.

**34.** (D) Total work done
Plotting force along the vertical axis against displacement on the horizontal axis creates a force-displacement graph. Mathematical integration of force with respect to displacement gives total work done. Therefore, the area bounded beneath the curve on a force-displacement diagram represents the total mechanical work performed on a moving object.

**35.** (A) The work done by kinetic friction on a sliding block.
Negative work occurs when applied force opposes displacement, forming an angle of one hundred eighty degrees between vectors. Kinetic friction acts in direction directly opposite to motion, making cosine of angle equal to negative one. Consequently, kinetic friction extracts mechanical energy from sliding objects, performing strictly negative work on moving bodies.

**36.** (C) The capacity of a system to perform work.
Energy represents a scalar physical property defined as the quantitative capacity of a physical system to perform work. It exists in multiple interchangeable forms, including kinetic, potential, thermal, and electrical energy. Energy is measured in Joules and can transform from one form into another while maintaining total conservation in isolated systems.

**37.** (A) It possesses only magnitude without any direction.
Physical quantities in classical mechanics are classified as scalars or vectors based on directional attributes. Scalar quantities are defined entirely by numerical magnitude and appropriate physical units, lacking spatial direction. Energy, speed, mass, and temperature represent scalar quantities that combine algebraically without

NODIA

and efficiency labeling across industrial and commercial sectors.

**78.** (C) The appliance is energy-efficient, using less power for equal output.
The Bureau of Energy Efficiency star rating system evaluates the operational energy performance of domestic electrical appliances. Higher star ratings signify superior energy efficiency, indicating that an appliance consumes significantly less electrical power to deliver equivalent operating performance, thereby reducing consumer electricity expenses and environmental carbon impacts over appliance lifespans.

**79.** (D) The Brundtland Report
The definitive definition of sustainable development originated in the landmark nineteen eighty-seven report titled Our Common Future, published by the World Commission on Environment and Development. Formally known as the Brundtland Report, it defined sustainable development as meeting present needs without compromising future generations' ability to meet their needs.

**80.** (C) High-temperature source, low-temperature sink, working substance
Standard thermodynamic heat engines convert thermal energy into mechanical work through cyclic processes using three essential components. A high-temperature heat source provides initial thermal energy, a working substance absorbs heat and expands to perform work, and a lower-temperature sink absorbs rejected waste heat to complete the continuous engine cycle.

**81.** (B) Otto cycle
The standard thermodynamic model for spark-ignition internal combustion engines is the air-standard Otto cycle. Comprising two reversible adiabatic processes and two constant-volume heat addition and rejection processes, the Otto cycle closely simulates key operating principles of four-stroke gasoline engines used in conventional light passenger automobiles and commercial motor vehicles.

**82.** (D) Heat generated by high compression of air.
Compression-ignition diesel engines operate entirely without electrical spark plugs. During the intake and compression strokes, pure atmospheric air is highly compressed inside the engine cylinder, raising internal air temperature and pressure significantly. When diesel fuel is injected into this compressed hot air, it ignites spontaneously due to elevated thermal conditions.

**83.** (B) Intake, Compression, Power, Exhaust
Four-stroke internal combustion engines operate through a continuous four-stage mechanical sequence. The process initiates with the intake stroke drawing fuel-air mixture, followed by compression of the charge. Igniting the compressed mixture produces the power stroke delivering work, and the cycle concludes with the exhaust stroke expelling combustion gases.

**84.** (C) $\eta = 1 - (T_2 / T_1)$
The Carnot efficiency equation defines the maximum theoretical efficiency attainable by any heat engine operating reversibly between two thermal reservoirs. Expressed mathematically, Carnot efficiency equals one minus the ratio of absolute sink temperature to absolute source temperature, demonstrating that thermodynamic efficiency depends strictly on working absolute temperatures of reservoirs.

**85.** (A) Compresses refrigerant vapor, raising its temperature and pressure.
In vapor-compression refrigeration cycles, the mechanical compressor serves as the primary circulation driver. The compressor draws low-pressure, low-temperature refrigerant gas from the evaporator unit and mechanically compresses it into high-pressure, high-temperature superheated vapor, providing the necessary pressure gradient for thermal heat rejection in the external condenser coils.

**86.** (D) Coefficient of Performance
Refrigeration systems and heat pumps do not convert heat into work, rendering standard efficiency metrics inapplicable. Instead, performance is evaluated using the Coefficient of Performance. The Coefficient of Performance is defined as the numerical ratio of desired cooling or heating energy delivered to the net electrical work input supplied.

**87.** (B) They contribute to stratospheric ozone layer depletion.
Chlorofluorocarbon compounds were historically utilized as refrigerants due to stability and non-toxicity. However, exposure to solar ultraviolet

Click Here to Buy book on Amazon

**68.** (C) Jaisalmer
Jaisalmer district in western Rajasthan functions as the primary hub for wind energy generation within the state. Favorable topographical conditions, expansive desert terrain, and steady high-speed wind currents make Jaisalmer ideal for large-scale wind farm developments, housing numerous wind turbine installations and contributing substantially to state wind power generation.

**69.** (A) Bhaloji (Jaipur)
The PM-KUSUM scheme supports solar power installation on agricultural lands to enhance rural energy security. The first grid-connected solar power plant commissioned under Component-A of this national program was successfully installed at Bhaloji village in Kotputli, Jaipur district, Rajasthan, generating clean electricity for localized rural agricultural distribution networks.

**70.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Rajasthan leads Indian states in solar power generation potential due to exceptional geographic conditions. The state receives abundant solar radiation with over three hundred clear sunny days per year and high direct normal irradiance. Vast expanses of uncultivated arid land further facilitate large-scale solar project construction across desert areas.

**71.** (B) Jaisalmer
India's premier commercial hybrid wind-solar power generation plant was commissioned by Adani Green Energy in Jaisalmer district, Rajasthan. By integrating wind turbines and solar photovoltaic panels at a single operational site, the hybrid energy facility maximizes land usage and electrical grid stability, optimizing overall clean power generation efficiency.

**72.** (C) Rajasthan Renewable Energy Corporation Limited (RRECL)
Rajasthan Renewable Energy Corporation Limited functions as the dedicated state nodal agency responsible for promoting, implementing, and coordinating non-conventional renewable energy projects across Rajasthan. Formed by merging state energy agencies, RRECL facilitates comprehensive policies, investment incentives, and operational frameworks for expanding solar, wind, biomass, and small hydro power initiatives.

**73.** (D) Ratio of useful energy output to total energy input.
Mechanical efficiency quantifies the operational performance of a physical machine or thermodynamic system. It is defined quantitatively as the dimensionless mathematical ratio of useful mechanical energy or work output produced by the system to the total energy or power input supplied, expressed either as a decimal fraction or a percentage value.

**74.** (A) Some input energy is dissipated as heat and sound due to friction.
Mechanical systems operating in reality cannot achieve one hundred percent efficiency due to irreversible energy dissipation mechanisms. Mechanical friction between moving contact surfaces, viscous resistance, and acoustic vibrations inevitably convert a fraction of input mechanical work into unrecoverable thermal energy, reducing useful energy output below total input energy.

NODIA

**75.** (B) Energy flows and proportional losses within a system.
Sankey diagrams serve as specialized visualization tools in thermal engineering and energy management. They depict energy transfers through a system using directional arrows whose explicit widths are directly proportional to energy flow quantities. These diagrams effectively illustrate useful energy outputs alongside heat losses across successive energy transformation stages.

**76.** (B) A severe shortage or bottleneck in energy resource supply to an economy.
The term energy crisis describes a significant bottleneck, supply disruption, or acute shortage in the availability of energy resources to an economy. Such crises are caused by rapid demand surges, geopolitical tensions, resource exhaustion, or infrastructure failures, leading to steep price escalation and economic challenges across energy sectors.

**77.** (B) 2001
The Energy Conservation Act was enacted by the Parliament of India in the year two thousand one to establish regulatory frameworks for improving energy efficiency. The act led to the creation of the Bureau of Energy Efficiency, mandating energy standards, energy auditing,

zero carbon emissions, emitting only pure water vapor, it represents a pivotal clean energy carrier for decarbonizing heavy industries and long-distance transport sectors globally.

**98.** (B) II → III → IV → I
Electromagnetic photon energy is directly proportional to wave frequency and inversely proportional to wavelength according to Planck's quantum relation. Arranged in order of increasing photon energy, infrared radiation possesses lowest energy, followed by visible light, ultraviolet radiation, and high-frequency X-rays, reflecting steadily increasing photon energy across the spectrum.

**99.** (A) I and II only
Molar specific heat measures energy required to raise one mole of substance by one Kelvin. For gases, constant pressure specific heat exceeds constant volume specific heat because thermal expansion performs external work. Water exhibits high specific heat capacity rather than low values, making statements regarding molar heat definitions and gas specific heat relations correct.

**100.** (D) I, II, and III
Mechanical work requires displacement in the direction of applied force. A person holding a stationary load performs no physical work due to zero displacement. Pushing an unmoving wall performs zero work similarly. In uniform circular motion, string tension acts perpendicular to movement, yielding zero net mechanical work in all three scenarios.

**101.** (A) II, III, and IV only
Fossil fuel utilization generates multiple environmental impacts. Coal combustion produces hazardous fly ash and toxic atmospheric pollutants rather than harmless gases. Marine oil spills create surface films impeding atmospheric oxygen dissolution, and natural gas systems release unburned fugitive methane, making statements concerning fly ash, marine damage, and fugitive emissions correct.

**102.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Deep aquatic life survives winter beneath frozen lakes because water exhibits anomalous thermal expansion. Water reaches maximum density at four degrees Celsius, causing dense four-degree water to sink to lake bottoms while colder water rises, freezes, and forms insulating surface ice layers that shield underlying liquid water from freezing.

**103.** (A) P-4, Q-3, R-1, S-2
Electromechanical devices systematically convert energy between distinct physical states. Electric motors transform electrical power into mechanical rotation, generators convert mechanical motion into electrical energy output, microphones convert sound waves into electrical signals, and loudspeakers convert incoming electrical audio signals back into audible mechanical sound vibrations.

**104.** (A) P-2, Q-3, R-1, S-4
Major energy generation projects in Rajasthan are distributed geographically across specific regional districts. Bhadla Solar Park is located in Jodhpur district, Rawatbhata Nuclear Power Plant operates in Chittorgarh district, Amarsagar Wind Power Plant is established in Jaisalmer, and Devgarh Wind Power Project is situated within Pratapgarh district.

**105.** (A) Kelvin, Fahrenheit, Celsius
Thermometric scales assign distinct numerical values to the freezing point of pure water under standard atmospheric pressure. On the Kelvin scale, freezing corresponds to two hundred seventy-three point one five, on the Fahrenheit scale it equals thirty-two, and on the Celsius scale it is defined as zero, establishing the descending numerical sequence.

**106.** (B) II → I → III → IV
The nuclear fuel cycle follows a sequential chronological progression. Uranium ore is mined and milled from geological deposits, after which isotopic enrichment increases fissile uranium concentration. Processed nuclear fuel undergoes controlled nuclear fission in reactors to produce electricity, and spent fuel is managed through long-term storage, reprocessing, or disposal.

**107.** (A) Mechanical equivalent of heat
James Prescott Joule demonstrated that mechanical work and thermal energy are fundamentally equivalent physical quantities. The mechanical equivalent of heat establishes the quantitative proportionality factor, represented universally by constant J, converting units of mechanical work into equivalent thermal energy

Downloaded from www.pdf.tube

light releases chlorine radicals from atmospheric CFCs, catalyzing the destructive breakdown of stratospheric ozone molecules. This depletion led to international agreements phasing out CFCs to preserve Earth's protective ozone layer.

**88.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Operating a refrigerator with its door open inside a sealed room increases ambient room temperature over time. Refrigerators transfer heat extracted from internal compartments to room air while continuously consuming electrical power. Because compressor work dissipates as additional heat into the environment, net heat output exceeds extracted heat, warming the room.

**89.** (D) $3.6 \times 10^6$ Joules
The Kilowatt-hour serves as the standard commercial unit for measuring electrical energy consumption. One Kilowatt equals one thousand Watts, and one hour equals three thousand six hundred seconds. Multiplying power by time converts one Kilowatt-hour to three million six hundred thousand Joules, or three point six times ten to six Joules.

**90.** (A) 4.184 J
The calorie represents a traditional unit of heat energy historically defined through water heating. One standard calorie equals the precise heat required to raise the temperature of one gram of pure liquid water by one degree Celsius. Expressed in metric System International units, one standard calorie converts to approximately four point one eight four Joules.

**91.** (B) Kinetic energy gained by an electron accelerated through 1 volt.
The electron-volt represents a convenient non-SI unit of energy widely applied in atomic, nuclear, and particle physics. One electron-volt is defined as the amount of kinetic energy gained or lost by a single fundamental electron charge accelerating through an electric potential difference of precisely one volt, converting to one point six times ten to minus nineteen Joules.

**92.** (B) 1 Joule = $10^7$ ergs
Mechanical work and energy are measured in Joules within the SI system and ergs within the CGS system. One Joule equals one Newton meter, whereas one erg equals one Dyne centimeter. Converting mass, length, and time metrics yields the conversion relationship where one Joule corresponds precisely to ten raised to power seven ergs.

NODIA

**93.** (A) P-2, Q-1, R-4, S-3
Physical quantities are measured using standardized units in international systems. Power measures work rate in Watts, mechanical work represents energy transfer measured in Joules, temperature is quantified on absolute thermodynamic scales in Kelvin, and force vector interactions causing acceleration are measured standardly in Newtons according to international measurement conventions.

**94.** (C) Carbon Footprint
A carbon footprint measures total direct and indirect greenhouse gas emissions produced by human activities, individuals, organizations, or manufactured products. Expressed in equivalent mass units of carbon dioxide, calculating carbon footprints assists environmental auditing, climate impact assessment, and formulation of targeted emission reduction strategies across commercial and domestic sectors.

**95.** (D) Carbon Dioxide
Carbon dioxide represents the primary anthropogenic greenhouse gas driving recent global climate change. Emitted in vast quantities through fossil fuel combustion, land deforestation, and industrial manufacturing processing, carbon dioxide possesses long atmospheric persistence, accounting for the largest total radiative forcing contribution among human-generated greenhouse gases in Earth's atmosphere.

**96.** (C) Kyoto Protocol
Carbon credits were established as market-based economic mechanisms to incentivize national and industrial greenhouse emissions reductions. Formally introduced under the framework of the nineteen ninety-seven Kyoto Protocol, flexible mechanisms such as Clean Development Mechanisms enabled industrial nations to trade carbon offset credits, financializing greenhouse gas mitigation globally.

**97.** (A) I, II, and IV only
Green hydrogen is produced by water electrolysis powered strictly by renewable electricity sources such as wind or solar power. Because green hydrogen production and combustion produce

realistic internal combustion engines, making statements detailing petrol and diesel ignition mechanisms accurate.

**118.** (C) It increases due to absorption of latent heat of fusion.
Phase change from solid ice to liquid water at zero degrees Celsius occurs at constant overall system temperature. Absorbed heat energy during melting represents latent heat of fusion, which breaks crystalline ice hydrogen bonds without increasing kinetic energy. This absorbed potential energy increases the total internal energy of the $H_2O$ molecular system.

**119.** (D) Net work done on the crate by external forces is zero.
Pushing a crate up an incline at constant speed implies zero linear acceleration. According to the Work-Energy Theorem, net work performed on an object equals the change in kinetic energy. Because velocity remains constant, kinetic energy remains unchanged, meaning net work performed by all combined external forces equals zero.

**120.** (A) The mass of helium is slightly less than hydrogen inputs, converting lost mass into energy.
Thermonuclear fusion in stellar cores merges four hydrogen protons into a single helium-four nucleus. The resulting helium nucleus possesses slightly less mass than the combined initial hydrogen protons. This mass defect converts into immense thermal and radiation energy according to Einstein's mass-energy equivalence principle, sustaining continuous solar power output.

**121.** (B) Ice melting under pressure and refreezing when pressure is released.
Regelation describes the physical process where ice melts under increased external pressure and refreezes when pressure is relieved. Because water expands upon freezing, applying pressure lowers its melting point, causing ice to liquefy locally. Once pressure is removed, the freezing point reverts, allowing melted water to refreeze solid immediately.

**122.** (D) I, II, and III
Photovoltaic solar operational efficiency is influenced by operating temperature, surface cleanliness, and optics. Elevated operating temperatures decrease silicon cell voltage and power output, dust accumulation blocks light transmission, and concentrated solar power systems utilize optical mirrors to focus sunlight onto small receiver areas, confirming all three photovoltaic efficiency statements.

**123.** (B) $10^6$
The prefix Mega represents a standard metric multiplier in the International System of Units denoting one million, or ten raised to the power of six. In energy units such as Mega electron-volts, one MeV equals one million electron-volts, providing convenient energy scales for high-energy nuclear and particle physics calculations.

**124.** (B) II, III, and IV only
Household energy and power systems obey distinct physical laws. A sixty-watt LED bulb consumes identical electrical energy in one hour as a sixty-watt incandescent bulb. Batteries store chemical energy, transformers alter AC voltage without creating new power, and inverters convert direct current into alternating current, confirming statements two, three, and four.

**125.** (D) Sublimation
Sublimation represents a phase transition in which a solid transitions directly into the gaseous state without passing through an intermediate liquid phase under specific pressure and temperature conditions. Solid carbon dioxide and dry ice demonstrate sublimation under standard atmospheric conditions, transforming directly from solid phase to gaseous carbon dioxide phase.

**126.** (C) It precisely doubles.
According to the kinetic theory of gases, the absolute temperature of an ideal gas is directly proportional to the average translational kinetic energy of its constituent molecules. Enclosing a gas in a rigid container keeps volume constant, and doubling absolute temperature doubles molecular average kinetic energy proportionally across the system.

**127.** (B) Increased pressure raises the boiling point of water.
Pressure cookers utilize sealed environments to elevate internal operating pressure during heating. Increasing ambient vapour pressure above liquid water raises its boiling point above one hundred degrees Celsius. This higher boiling water temperature transfers thermal energy into

Click Here to Buy book on Flipkart

# CHAPTER 06
# Diet and Nutrition

NODIA

**1.** Nutrition is broadly defined as the biochemical and physiological process by which an organism uses food to support its life. Which of the following is not considered a primary function of human nutrition?
(A) Provision of baseline energy needed for metabolic cellular activities
(B) Alteration of fundamental genetic sequences within the host genome
(C) Regulation of human immune responses and internal organ functions
(D) Synthesis of non-essential amino acids from internal body reserves

**2.** Consider the following statements regarding the components of a balanced diet:
I. It must provide adequate calories primarily from carbohydrates and fats.
II. It requires micronutrients only when the individual is suffering from a specific clinical deficiency.
III. It must contain dietary fiber and water, even though they do not yield measurable energy.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**3.** Which of the following statements incorrectly distinguishes macronutrients from micronutrients?
(A) Macronutrients primarily include dietary carbohydrates, proteins, and lipids.
(B) Micronutrients are required in milligram or microgram daily quantities.
(C) Macronutrients act as co-enzymes in cellular respiration.
(D) Micronutrients primarily include essential vitamins and organic dietary minerals.

**4.** Read the following statements regarding dietary immunity:
**Assertion (A):** Consuming a balanced diet guarantees complete immunity from infectious diseases.
**Reason (R):** A balanced diet maintains the structural integrity of the immune system and produces antibodies.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**5.** In a standard balanced diet designed for an adult Indian, what is the generally recommended proportional distribution of daily energy intake from carbohydrates, proteins, and fats respectively?
(A) 30-35% : 45-50% : 15-20%
(B) 55-60% : 10-15% : 20-30%
(C) 40-45% : 35-40% : 15-20%
(D) 65-70% : 05-10% : 20-25%

**6.** Which of the following best defines the concept of 'empty calories' in nutrition?
(A) Foods that possess zero total caloric content while containing rich vitamins
(B) Foods providing high energy but minimal essential micronutrients
(C) Foods that travel completely through the digestive tract without undergoing nutrient absorption
(D) Dietary fiber sources and indigestible roughage that yield no usable ATP energy

**7.** Consider the following stages of human holozoic nutrition:
I. Digestion
II. Ingestion
III. Assimilation
IV. Absorption
V. Egestion
Which of the following represents the correct physiological sequence?
(A) II, I, IV, III, V
(B) I, II, IV, III, V
(C) II, IV, I, V, III
(D) II, I, III, IV, V

causing atmospheric moisture to condense and freeze into surface frost on glass.

**138.** (B) Optimal balance of aerodynamic efficiency, structural stability, and cost.
Commercial wind turbine designs utilize three aerodynamic blades to achieve optimal balance across key engineering parameters. Three-bladed rotors provide high aerodynamic conversion efficiency, smooth rotational dynamics, reduced gyroscopic stress during directional yaw movements, and structural stability, offering superior mechanical and economic performance compared to two or four blade configurations.

**139.** (A) Liquid Helium
Liquid helium exhibits an exceptionally low normal boiling point of four point two Kelvin under standard atmospheric pressure. This extremely low boiling temperature renders liquid helium indispensable as a primary cryogenic refrigerant in low-temperature physics research, enabling effective cooling of superconducting magnets, quantum computing devices, and specialized scientific apparatus.

**140.** (B) II and III only
Carbon emission reduction strategies combine technological transitions and biological absorption. Electric vehicle adoption eliminates direct vehicular tailpipe emissions, while afforestation establishes biological carbon sinks absorbing atmospheric carbon dioxide. Carbon offsets fund mitigation elsewhere rather than physically erasing emitted $CO_2$ molecules, validating electric transport and afforestation environmental impacts.

www.nodia.in

NODIA

exhalation
(C) Fluid lost rapidly from intestinal mucosal linings during acute severe diarrheal illness
(D) The pathological accumulation of intracellular fluid trapped inside soft tissue during severe edema

**55.** The daily basal water requirement of an individual is most appropriately estimated based on which of the following physiological parameters?
(A) Structural bone mineral density and skeletal mass
(B) Specific blood group type and plasma antibodies
(C) Quantitative dietary saturated fat consumption levels
(D) Total caloric expenditure and surface area

**56.** Match the types of dietary fiber in List I with their typical nutritional characteristics in List II:
**List I: (Dietary Fiber)**
P. Cellulose
Q. Pectin
R. Lignin
S. Mucilage
**List II: (Nutritional Characteristic)**
1. Highly insoluble, structural part of plant cell walls
2. Soluble fiber found in apples, forms gels
3. Non-carbohydrate complex polymer, highly woody
4. Soluble, thick viscous fiber found in seeds like psyllium
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-1, R-4, S-3
(C) P-1, Q-3, R-2, S-4
(D) P-3, Q-2, R-1, S-4

**57.** Which specific physiological benefit is most strongly associated with an adequate intake of insoluble dietary fiber (roughage)?
(A) Rapid and sustained elevation of arterial blood glucose concentration immediately following a meal
(B) Direct physiological absorption of circulating serum cholesterol directly from the bloodstream
(C) Prevention of constipation by increasing fecal bulk and reducing transit time
(D) Microbial synthesis of non-essential and essential amino acids inside the human large intestine

**58.** Read the following statements regarding dietary fiber:
**Assertion (A):** Dietary fiber is considered an essential component of a balanced diet despite providing virtually no caloric energy to humans.
**Reason (R):** Fiber maintains optimal gastrointestinal motility and fosters a healthy colonic microbiome.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**59.** High intake of which of the following food categories is the best preventative nutritional strategy against diverticular disease of the colon?
(A) Simple refined sugars and syrup
(B) Concentrated animal proteins
(C) Saturated animal fats and oils
(D) Whole grains and vegetables

**60.** Identify the correct statement regarding the impact of soluble dietary fiber on metabolic health.
(A) Soluble fiber completely prevents the gastrointestinal breakdown and digestion of all dietary proteins.
(B) It helps lower cholesterol by binding to intestinal bile acids.
(C) Soluble fiber significantly increases the postprandial glycemic index of ingested carbohydrate foods.
(D) Soluble fiber hardens stool consistency, directly leading to acute severe intestinal blockages.

**61.** In the context of global health, the "Double Burden of Malnutrition" is best defined as:
(A) The simultaneous clinical occurrence of severe childhood wasting and chronic structural stunting within a single infant patient.
(B) The concurrent systemic deficiency of both dietary macronutrients and critical micronutrients across a specific vulnerable demographic group.
(C) Coexistence of undernutrition alongside overweight, obesity, or diet-related non-communicable diseases.
(D) Having clinical iron-deficiency anemia and endemic iodine-deficiency goiter simultaneously within the same individual

Downloaded from www.pdf.tube

**8.** The Recommended Dietary Allowance (RDA) for a nutrient is most appropriately defined as:
(A) The daily intake level meeting requirements of nearly all healthy individuals.
(B) The upper physiological threshold of daily nutrient intake above which toxic side effects occur.
(C) The minimum estimated dietary quantity required to prevent clinical deficiency symptoms in half the population.
(D) The calculated average quantity of dietary nutrients routinely ingested by an adult population.

**9.** Consider the following statements regarding nutrients:
**Statement I:** Vitamins and minerals are primarily classified as energy-yielding nutrients.
**Statement II:** Proteins can act as an energy source when carbohydrate and fat reserves are depleted.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**10.** Which of the following nutritional compounds is the odd one out regarding its primary functional role in a standard human diet?
(A) Ascorbic Acid
(B) Glucose
(C) Triglycerides
(D) Starch

**11.** What is the primary physiological function of dietary carbohydrates in the human body?
(A) Synthesizing structural phospholipids for cell membranes
(B) Directly catalyzing metabolic and cellular enzymatic reactions
(C) Regulating nuclear gene expression and transcriptional activity
(D) Serving as a main source of cellular energy

**12.** Match the carbohydrates in List I with their biochemical classification in List II:
**List I: (Carbohydrate)**
P. Glucose
Q. Sucrose
R. Glycogen
S. Galactose
**List II: (Biochemical Classification)**
1. Polysaccharide
2. Monosaccharide
3. Disaccharide
4. Monosaccharide found in milk sugar
(A) P-2, Q-4, R-1, S-3
(B) P-2, Q-3, R-1, S-4
(C) P-4, Q-3, R-1, S-2
(D) P-3, Q-2, R-1, S-4

**13.** When dietary carbohydrates are consumed in excess of immediate energy needs, the body primarily stores the surplus as glycogen in which specific organs?
(A) Adipose tissue and kidneys
(B) Spleen and pancreas
(C) Liver and skeletal muscles
(D) Brain and heart muscle

**14.** Which of the following is an expected physiological effect of severe long-term carbohydrate deficiency in the human body?
(A) Excessive systemic synthesis and secretion of pancreatic insulin
(B) Increased physiological storage of glycogen within muscle tissue matrix
(C) Enhanced intestinal absorption of essential water-soluble vitamins
(D) Induction of ketosis from incomplete fat breakdown

**15.** Read the following statements regarding carbohydrate metabolism:
**Assertion (A):** Humans cannot derive energy from dietary cellulose.
**Reason (R):** The human digestive system lacks the enzyme cellulase required to break the beta-glycosidic linkages in cellulose.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**16.** Which of the following is not classified as a complex carbohydrate (polysaccharide)?
(A) Amylose
(B) Maltose
(C) Cellulose
(D) Chitin

NODIA

P. Vitamin $B_1$
Q. Vitamin $B_2$
R. Vitamin $B_3$
S. Vitamin C

**List II: (Chemical Name)**

1. Niacin
2. Ascorbic acid
3. Thiamine
4. Riboflavin

(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-3, Q-4, R-1, S-2
(D) P-1, Q-4, R-3, S-2

**36.** Select the correct sequence representing the progressive clinical stages of Vitamin A deficiency from earliest to most severe:
(A) Bitot's spots → Night blindness → Conjunctival xerosis → Keratomalacia
(B) Night blindness → Conjunctival xerosis → Bitot's spots → Keratomalacia
(C) Keratomalacia → Night blindness → Bitot's spots → Conjunctival xerosis
(D) Conjunctival xerosis → Keratomalacia → Night blindness → Bitot's spots

**37.** Identify the correct statement regarding Vitamin C.
(A) It is highly heat-stable and resistant to destruction during prolonged boiling.
(B) Its deficiency leads to pellagra, characterized by dermatitis and dementia.
(C) It enhances the gastrointestinal absorption of non-heme iron.
(D) It is synthesized abundantly by human gut microbiota.

**38.** Vitamin D is uniquely synthesized in the human skin upon exposure to ultraviolet B (UVB) radiation. Which compound serves as the direct precursor for this dermal synthesis?
(A) Pro-vitamin beta-carotene precursor
(B) 7-dehydrocholesterol
(C) Plant-derived ergosterol sterol
(D) Gastrointestinal cholecystokinin

**39.** Which of the following vitamins is strictly required for the hepatic synthesis of prothrombin and other blood-clotting factors?
(A) Vitamin A
(B) Vitamin E
(C) Vitamin D
(D) Vitamin K

**40.** The efficient absorption of dietary Vitamin $B_{12}$ in the terminal ileum strictly requires the presence of which substance secreted by the stomach?
(A) Intrinsic factor
(B) Hydrochloric acid
(C) Pepsinogen
(D) Bile salts

**41.** Consider the following clinical symptoms:
I. Diarrhea
II. Dermatitis
III. Dementia
Which nutritional deficiency is classically identified by this combination of symptoms?
(A) Beriberi (Vitamin $B_1$ deficiency)
(B) Scurvy (Vitamin C deficiency)
(C) Pellagra (Niacin deficiency)
(D) Rickets (Vitamin D deficiency)

**42.** Adequate periconceptional intake of folic acid is most critical in pregnant women to prevent which specific complication in the developing fetus?
(A) Fetal neural tube defects
(B) Congenital ocular cataracts
(C) Infantile neonatal scurvy
(D) Severe fetal macrosomia

**43.** The proper absorption and bone-mineralization function of calcium in the human body is deeply dependent on an adequate supply of which vitamin?
(A) Vitamin $B_6$
(B) Vitamin K
(C) Vitamin E
(D) Vitamin D

**44.** Read the following statements regarding iron absorption:
**Assertion (A):** Consuming a glass of orange juice with a vegetarian iron-rich meal improves iron status.
**Reason (R):** Ascorbic acid in orange juice reduces ferric iron to ferrous iron, which is more readily absorbed in the intestine.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

Click Here to Buy book on Amazon

trans fats across Indian food products.

**26.** Complete oxidation of one gram of dietary fat yields approximately how much physiological energy?
(A) 4 kcal
(B) 7 kcal
(C) 9 kcal
(D) 12 kcal

**27.** The body primarily stores excess dietary lipids in specialized cells called adipocytes. What is the predominant chemical form of this stored fat?
(A) Phospholipids
(B) Free fatty acids
(C) Sterols
(D) Triglycerides

**28.** Identify the correct pair regarding the physiological role of cholesterol in the human body.
(A) Cholesterol - Primary structural stabilizing component found within rigid plant cell wall matrices
(B) Cholesterol - Precursor for Vitamin D and steroid hormone synthesis
(C) Cholesterol - Main catalytic enzyme responsible for gastric protein digestion inside the stomach
(D) Cholesterol - Major water-soluble antioxidant protecting cellular organelles in blood plasma

**29.** Which of the following groups contains only fat-soluble vitamins?
(A) Vitamin C, Vitamin $B_{12}$, Vitamin E
(B) Vitamin $B_1$, Vitamin $B_2$, Vitamin $B_6$, Vitamin C
(C) Vitamin A, Vitamin D, Vitamin E, Vitamin K
(D) Vitamin D, Vitamin K, Folic Acid

**30.** Read the following statements regarding vitamin storage:
**Assertion (A):** Water-soluble vitamins, with the exception of $B_{12}$, are generally not stored in the body in large quantities and must be consumed regularly.
**Reason (R):** Water-soluble vitamins are easily excreted through urine when their concentration exceeds the renal threshold.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**31.** Because they are stored in the liver and adipose tissues, excessive intake of which vitamins is most likely to cause clinical toxicity (hypervitaminosis)?
(A) Vitamin A and Vitamin D
(B) Vitamin B complex and Vitamin C
(C) Vitamin $B_{12}$ and Folate
(D) Biotin and Pantothenic acid

**32.** In human metabolism, the primary biochemical role of the B-complex group of vitamins is to:
(A) Act as vital structural components within lipid bilayers of cellular membranes
(B) Function as coenzymes in cellular metabolic reactions
(C) Serve directly as high-yielding primary energy sources perfectly analogous to carbohydrates
(D) Directly transport molecular oxygen throughout systemic capillaries in the human bloodstream

NODIA

**33.** Consider the following statements regarding vitamins:
**Statement I:** Scurvy is a deficiency disease caused by a lack of a fat-soluble vitamin.
**Statement II:** Vitamin C is required for the hydroxylation of proline and lysine in collagen synthesis.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**34.** The term "Vitamin" was originally coined in 1912 by which scientist after isolating a micronutrient essential for life?
(A) Casimir Funk
(B) Louis Pasteur
(C) Alexander Fleming
(D) Frederick Gowland Hopkins

**35.** Match the vitamins in List I with their correct chemical names in List II:
**List I: (Vitamin)**

food much faster, accelerating cooking rates significantly, especially at high geographical altitudes.

**128.** (D) 1000 J
Conservation of mechanical energy dictates that potential energy lost during free fall converts into kinetic energy before impact. Multiplying a mass of five kilograms, gravitational acceleration of ten meters per second squared, and height of twenty meters yields one thousand Joules of initial potential energy, converting to one thousand Joules of kinetic energy.

**129.** (A) Rajasthan Biomass Energy Policy
The Rajasthan Biomass Energy Policy was specifically formulated to promote electricity generation from agricultural residues, crop waste, and mustard husk. By incentivizing biomass power plants, the policy promotes renewable energy generation, reduces agricultural open waste burning, and creates sustainable economic opportunities across rural farming communities throughout Rajasthan state.

**130.** (C) 100 W
Average power developed equals work done divided by time duration taken. Lifting a fifty-kilogram mass by two meters against gravity requires work equal to mass times acceleration times height, producing one thousand Joules. Dividing one thousand Joules by ten seconds time duration yields an average mechanical power output of one hundred Watts.

**131.** (A) Power
The derived physical unit Joule per Second measures the rate of energy consumption or work performed per unit time. Defined as one Watt in System International units, Joule per Second serves as the fundamental unit of power, quantifying how rapidly energy transforms or transfers within mechanical and electrical systems.

**132.** (D) Hydroelectric Plant
Hydroelectric power generation relies on gravitational potential energy of naturally flowing water stored behind dams. Because water flow represents a naturally replenished renewable resource requiring no purchased combustible fuel, hydroelectric power plants operate with minimal recurring fuel and running costs compared to thermal, nuclear, or diesel facilities over their lifespans.

**133.** (B) Usable power delivered at the engine crankshaft.
Brake horsepower measures actual usable mechanical power delivered by an engine output shaft or crankshaft after accounting for internal friction, pumping, and transmission energy losses. Quantified using dynamic absorption dynamometers or prony brakes, brake horsepower evaluates real mechanical power available to drive external machinery or propel motorized vehicles.

**134.** (C) Uneven thermal expansion between inner and outer glass surfaces.
Glass is a poor thermal conductor. Pouring boiling hot water into a glass tumbler causes the inner glass surface to heat and expand rapidly while the outer surface remains cool. This non-uniform thermal expansion creates extreme internal mechanical stress within the rigid glass structure, causing the tumbler to crack suddenly.

**135.** (B) II and III only
Specific heat capacity quantifies thermal energy required to change mass temperature, whereas thermal conductivity dictates conduction speed. Materials with high specific heat demand substantial heat input for temperature shifts, enabling oceans to moderate coastal climates effectively, making statements regarding high energy absorption requirements and coastal climate moderation correct.

**136.** (A) Elastic potential energy
When an elastic bouncing ball impacts a rigid ground surface, its downward kinetic energy deforms the ball's material structure. During maximum structural compression, kinetic energy converts temporarily into elastic potential energy stored within deformed molecular chemical bonds, which subsequently releases as kinetic energy as the ball rebounds upward.

**137.** (B) Radiative cooling to the clear sky
On clear winter nights, car windshields radiate thermal energy continuously toward cold outer space. Because the open atmosphere acts as a poor infrared absorber under clear skies, radiative cooling lowers windshield glass temperatures below ambient air temperature,

Downloaded from www.pdf.tube

**45.** Dietary iodine is fundamentally required by the human body for the synthesis of hormones in which endocrine gland?
(A) Pituitary gland
(B) Adrenal gland
(C) Thyroid gland
(D) Pancreas

**46.** Which trace mineral plays a critical catalytic role in over 300 enzymes, supports immune function, and is essential for normal taste and smell perception?
(A) Copper
(B) Selenium
(C) Manganese
(D) Zinc

**47.** Match the minerals in List I with their classical deficiency conditions in List II:
**List I: (Mineral)**
P. Iron
Q. Calcium
R. Iodine
S. Zinc
**List II: (Deficiency Condition)**
1. Goiter
2. Microcytic anemia
3. Growth retardation and impaired immunity
4. Osteoporosis
(A) P-2, Q-4, R-1, S-3
(B) P-1, Q-4, R-2, S-3
(C) P-2, Q-3, R-1, S-4
(D) P-4, Q-2, R-1, S-3

**48.** In public health nutrition, trace amounts of fluorine are often monitored because:
(A) Its acute systemic deficiency directly causes severe forms of clinical microcytic anemia.
(B) Optimal levels prevent dental caries, whereas excess leads to fluorosis.
(C) It serves as the main biological mineral essential for cardiac blood coagulation pathways.
(D) It progressively replaces structural calcium inside bone marrow during chronic malnutrition.

**49.** Consider the following minerals:
I. Sodium
II. Potassium
III. Calcium
IV. Phosphorus
Which combination accurately lists only macrominerals (major minerals) required by adults in amounts greater than 100 mg/day?
(A) I and III only
(B) II, III, and IV only
(C) I, II, III, and IV
(D) I and II only

**50.** Identify the incorrect statement regarding cellular mineral distribution.
(A) The sodium-potassium pump transports sodium inside and potassium outside to yield ATP.
(B) Sodium functions as the major extracellular cation regulating systemic plasma volume.
(C) Potassium serves as the predominant intracellular cation maintaining osmotic cellular pressure.
(D) Chloride acts as the major extracellular anion regulating systemic fluid balance and acid-base equilibrium.

**51.** Approximately what percentage of a healthy adult human's total body weight is composed of water?
(A) 20 - 30%
(B) 40 - 50%
(C) 55 - 65%
(D) 80 - 90%

**52.** Consider the following functions:
I. Thermoregulation via sweat evaporation
II. Acting as a universal biological solvent
III. Providing highly concentrated caloric energy
Which combination of functions is correctly attributed to dietary water?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**53.** Which hormone, secreted by the posterior pituitary, plays the primary role in regulating body water balance by promoting water reabsorption in the kidneys?
(A) Pancreatic insulin hormone
(B) Thyroid thyroxine hormone
(C) Antidiuretic hormone (ADH)
(D) Pancreatic glucagon peptide

**54.** In human physiology, 'insensible water loss' refers to:
(A) Water lost continuously and exclusively through excessive urinary excretion in uncontrolled diabetes
(B) Unnoticed water loss via skin diffusion and

NODIA

**17.** Proteins are complex macromolecules composed of fundamental building blocks known as:
(A) Nucleotides
(B) Amino acids
(C) Fatty acids
(D) Monosaccharides

**18.** Consider the following clinical features regarding childhood protein-energy malnutrition:
I. Presence of extensive edema (swelling)
II. Severe muscle wasting with a 'skin and bones' appearance
III. Enlarged fatty liver
IV. Usually occurs in infants under 1 year of age
Which combination of features is correct for Kwashiorkor rather than Marasmus?
(A) I and III only
(B) II and IV only
(C) I, II, and III only
(D) I, III, and IV only

**19.** Identify the correct statement regarding dietary amino acids.
(A) Essential amino acids can be readily synthesized internally by human physiological tissues from metabolic carbohydrate precursors.
(B) Non-essential amino acids are completely redundant and unnecessary for biological protein synthesis.
(C) Essential amino acids must be obtained through diet as the body cannot synthesize them.
(D) There are precisely thirty-five essential amino acids strictly required for human biological function.

**20.** Which of the following plant-based food sources is widely recognized as providing a 'complete protein', containing all essential amino acids in adequate proportions?
(A) Whole grain wheat
(B) Red and green lentils
(C) Unpeeled whole almonds
(D) Soybeans

**21.** Unlike carbohydrates and lipids, all dietary proteins uniquely contain which structural chemical element?
(A) Carbon
(B) Oxygen
(C) Nitrogen
(D) Hydrogen

**22.** What is meant by the "protein-sparing action" of carbohydrates in nutrition?
(A) Carbohydrates prevent the structural denaturing and physical breakdown of proteins during food preparation.
(B) Carbohydrates preserve proteins for tissue synthesis instead of energy oxidation.
(C) Carbohydrates significantly increase the renal filtration and urinary excretion of surplus amino acids.
(D) Carbohydrates directly bind with dietary proteins inside the gastrointestinal lumen to retard enzyme digestion.

**23.** Consider the following statements concerning dietary fats:
I. Saturated fats typically lack double bonds between carbon atoms and are solid at room temperature.
II. Unsaturated fats contain one or more double bonds and are generally liquid at room temperature.
III. Excessive intake of polyunsaturated fats directly lowers high-density lipoprotein (HDL) to dangerous levels in all individuals.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**24.** Linoleic acid and Alpha-linolenic acid are nutritionally significant because they are:
(A) Essential fatty acids not synthesized by humans
(B) Essential amino acids involved in muscular tissue synthesis
(C) Non-essential fatty acids readily synthesized by hepatic metabolic pathways
(D) Toxic trans-fatty acid isomers synthesized during commercial high-heat frying

**25.** Identify the incorrect statement regarding trans fats.
(A) They are formed artificially during the commercial partial hydrogenation of fluid vegetable oils.
(B) Consistently consuming trans fats is directly linked to an increased risk of chronic cardiovascular diseases.
(C) They decrease LDL cholesterol and increase HDL cholesterol levels.
(D) Food safety regulatory authorities have mandated strict concentration limits on

Click Here to Buy book on Flipkart

patient.

**62.** Consider the following WHO Body Mass Index (BMI) diagnostic categories for adults:
I. Normal weight
II. Obese Class I
III. Underweight
IV. Overweight
Which of the following represents the categories ordered in increasing order of their mathematical range values?
(A) I, III, IV, II
(B) III, I, IV, II
(C) III, IV, I, II
(D) I, IV, III, II

**63.** Which of the following statements incorrectly distinguishes between the primary indices of childhood undernutrition?
(A) Wasting is permanent, while stunting is rapidly cured with high calories.
(B) Stunting is anthropometrically defined as low height-for-age, directly reflecting long-term chronic undernutrition.
(C) Wasting is anthropometrically defined as low weight-for-height, directly reflecting severe acute undernutrition.
(D) Underweight is a composite clinical growth indicator defined specifically as low weight-for-age in pediatric standards.

**64.** The term "Hidden Hunger" in nutritional epidemiology specifically refers to:
(A) The acute psychological craving and biological urge for calorie-dense fast foods.
(B) Deficiency of vitamins and minerals despite adequate caloric intake.
(C) Undiagnosed chronic protein-energy malnutrition observed among frail elderly hospital populations.
(D) The transient physiological state of extended fasting maintained prior to routine diagnostic blood testing.

**65.** Which of the following anthropometric tools is primarily utilized at the community level for the rapid screening of Severe Acute Malnutrition (SAM) in children aged 6 to 59 months?
(A) Skinfold calipers
(B) MUAC (Mid-Upper Arm Circumference) tape
(C) Dual-energy X-ray absorptiometry (DEXA)
(D) Bioelectrical impedance scale

**66.** According to the National Family Health Survey-5 (NFHS-5) data for India, the prevalence of childhood stunting has shown which trend compared to NFHS-4?
(A) A marginal decline, hovering near 35.5% nationally
(B) A dramatic surge and nationwide increase of over ten percentage points
(C) Complete and total eradication of stunting cases across all major Indian states
(D) Nationwide childhood stunting levels fell below 5% for the very first time in recorded history

**67.** Consider the following diagnostic criteria:
I. Weight-for-height Z-score below -3 standard deviations
II. Mid-Upper Arm Circumference (MUAC) less than 115 mm
III. Presence of bilateral pitting edema
IV. Body Mass Index (BMI) greater than 30
Which combination represents the correct WHO diagnostic criteria for Severe Acute Malnutrition (SAM) in children?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and III only
(D) I, II, III, and IV

**68.** Under government schemes, which grassroots institution serves as the primary focal point for the delivery of supplementary nutrition and non-formal preschool education to combat childhood malnutrition?
(A) Primary Health Centre (PHC)
(B) Gram Panchayat Office
(C) District Hospital
(D) Anganwadi Centre

**69.** The Government of India redesigned and renamed the historic National Programme of Mid-Day Meal in Schools. What is its current official name?
(A) PM KISAN Samman Nidhi
(B) PM AASHA Annadata Scheme
(C) PM POSHAN Scheme
(D) PM MATRITVA Vandana Yojana

**70.** The "Malnutrition-Infection Cycle" is a well-documented concept. Which of the following best describes this vicious cycle?
(A) Malnourished children become physiologically immune and resistant to infectious pathogens due to heavily depressed cellular metabolism.

Downloaded from www.pdf.tube

**125.** Which of the following foods is the odd one out, being generally poor in natural antioxidants compared to the others?
(A) Fresh blueberries
(B) Organic green tea
(C) White rice
(D) Raw green spinach

**126.** Under the National Food Security Act (NFSA) of 2013, what percentage of the rural and urban population, respectively, is legally entitled to receive highly subsidized foodgrains?
(A) 50% Rural and 33% Urban
(B) 75% Rural and 50% Urban
(C) 100% Rural and 50% Urban
(D) 60% Rural and 60% Urban

**127.** Under the Antyodaya Anna Yojana (AAY) category of the NFSA, what is the fixed monthly foodgrain entitlement per eligible household?
(A) 5 kg per person
(B) 25 kg per household
(C) 35 kg per household
(D) 50 kg per household

**128.** Section 4 of the National Food Security Act guarantees every pregnant and lactating mother a maternity benefit of not less than:
(A) Rs 2,000
(B) Rs 4,000
(C) Rs 6,000
(D) Rs 10,000

**129.** Identify the correct statement regarding the pricing of subsidized foodgrains under the NFSA for Priority Households.
(A) Rice is provided at Rs 3/kg, Wheat at Rs 2/kg, and Coarse grains at Rs 1/kg.
(B) Rice is provided at Rs 5/kg, Wheat at Rs 4/kg, and Coarse grains at Rs 3/kg.
(C) All grains are provided entirely free of cost without any pricing bracket.
(D) Wheat is priced higher than rice due to its nutritional profile.

**130.** If an eligible beneficiary does not receive their entitled foodgrains or meals under the NFSA, the Act legally mandates the payment of a:
(A) Food Security Allowance to the beneficiary
(B) Severe penalty to the local MLA
(C) Double ration quantum in the following month
(D) Free medical insurance policy

NODIA

**131.** The 'Indira Gandhi Matritva Poshan Yojana' was launched by the Rajasthan Government to improve maternal and child nutrition. A key feature of this scheme is the provision of a cash incentive for the birth of a second child. What is the total amount provided?
(A) Rs 4,000
(B) Rs 5,000
(C) Rs 6,000
(D) Rs 8,000

**132.** Under the 'Mukhyamantri Bal Gopal Yojana' implemented in Rajasthan to enhance the nutritional status of school children, what specific nutritional supplement is provided to students of classes 1 to 8?
(A) Nutrient-fortified wheat biscuits
(B) Freshly boiled poultry eggs
(C) Fresh seasonal organically grown fruits
(D) Reconstituted milk

**133.** Identify the correct statement regarding the state-specific 'RajPusht' project implemented in selected tribal and vulnerable districts of Rajasthan.
(A) It strictly provides direct non-refundable cash grants to elderly male heads of households to purchase farm equipment and agricultural tools.
(B) It provides subsidized fast food vouchers and unlimited energy drink supplies exclusively to urban college students living in hostel accommodations.
(C) It targets low birth weight and wasting via cash transfers and nutrition behavior communication.
(D) It is a major rural canal construction and agricultural irrigation infrastructure project that is completely unrelated to public health nutrition.

**134.** Identify the incorrect statement regarding the nutritional status of Rajasthan based on the National Family Health Survey-5 (NFHS-5) data.
(A) A significant proportion of women aged 15-49 years in Rajasthan remain anemic.
(B) Stunting among children under 5 in Rajasthan has been completely eradicated.
(C) Wasting (low weight-for-height) remains a major public health concern in the state.
(D) The percentage of children aged 6-59 months who are anemic actually increased compared to NFHS-4.

**80.** The Government of India's primary systemic intervention to eradicate iodine deficiency disorders nationwide has been the successful implementation of:
(A) Free weekly iodine tablet distribution in schools
(B) Universal Salt Iodization (USI) program
(C) Mandatory iodine fortification of all cooking oils
(D) Subsidized distribution of marine fish under NFSA

**81.** Consider the following statements regarding goitrogens:
**Statement I:** Goitrogens are naturally occurring compounds that interfere with the normal function of the thyroid gland.
**Statement II:** Cabbage, cauliflower, and cassava contain significant levels of goitrogens.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**82.** Which of the following is naturally the richest dietary source of iodine?
(A) Marine fish and seaweed
(B) Whole pulses and edible legumes
(C) Freshly harvested citrus fruits
(D) Processed polished white rice grains

**83.** According to the ICMR-NIN (2020) dietary guidelines, a pregnant woman in her second or third trimester requires approximately how many additional kilocalories per day above her normal requirement?
(A) +150 kcal
(B) +350 kcal
(C) +600 kcal
(D) +1000 kcal

**84.** To ensure optimal infant nutrition, the World Health Organization strongly recommends exclusive breastfeeding without any other food or water for exactly what duration after birth?
(A) 3 months
(B) 6 months
(C) 9 months
(D) 12 months

**85.** In pediatric nutrition, what does the term 'Complementary Feeding' (historically called weaning) specifically refer to?
(A) The complete and total abrupt cessation of all maternal breast milk supply.
(B) The daily pediatric administration of synthetic vitamin and mineral syrups to infants.
(C) Gradual introduction of solid foods alongside continued breastfeeding.
(D) Feeding the developing infant exclusively with processed commercial infant formula products.

**86.** Read the following statements regarding geriatric nutrition:
**Assertion (A):** Geriatric (elderly) populations often suffer from Vitamin $B_{12}$ and iron deficiencies even if their dietary intake appears adequate.
**Reason (R):** Aging is frequently associated with reduced gastric acid secretion (achlorhydria), which impairs the absorption of these specific nutrients.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**87.** Consider the following physiological and socio-economic factors:
I. Rapid growth spurts leading to increased caloric and protein needs
II. Onset of menstruation increasing the requirement for iron
III. High susceptibility to eating disorders and body image issues
IV. Gradual loss of bone mineral density requiring maximum calcium absorption
Which combination represents the key nutritional considerations specifically critical during adolescent girlhood?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and IV only
(D) I, II, III, and IV

**88.** Identify the correct statement regarding colostrum, the first milk produced by the mother immediately after delivery.
(A) It is rich in Secretory IgA antibodies, granting passive immunity to infants.
(B) It is considered nutritionally poor and low-

Click Here to Buy book on Amazon

**108.** Consider the following statements regarding the RUCO (Repurpose Used Cooking Oil) initiative by FSSAI:
I. Repeated frying degrades oil and forms Total Polar Compounds (TPCs) which are toxic.
II. FSSAI mandates that TPC in cooking oil must not exceed 25%.
III. RUCO aims to convert discarded used cooking oil into biodiesel.
IV. It encourages street vendors to re-use the same oil indefinitely.
Which combination is correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and III only
(D) I, II, III, and IV

**109.** What is the central theme of FSSAI's "Eat Right India" movement?
(A) To legally enforce a strictly purely vegetarian dietary pattern across all public state institutions.
(B) To strictly mandate standard quantitative portion sizes across all commercial domestic restaurants.
(C) Transforming the food system to ensure safe, healthy, sustainable food for all.
(D) To heavily subsidize large commercial fast-food chains that comply fully with federal tax requirements.

**110.** Arrange the standard legal sequence of actions taken by a Food Safety Officer under FSSAI regulations upon suspecting food adulteration:
I. Adjudication/Prosecution if standards fail
II. Sending the sealed sample to a notified Food Testing Laboratory
III. Drawing a sample of the suspected food article
IV. Receipt of the analytical report from the Food Analyst
Which of the following is the correct sequence?
(A) III, II, IV, I
(B) II, III, IV, I
(C) III, IV, II, I
(D) IV, III, II, I

**111.** Basal Metabolic Rate (BMR) is best defined as:
(A) Minimum energy needed to maintain basal vital functions while resting, awake, and fasting.
(B) The total comprehensive metabolic energy expended by an active individual during strenuous physical labor.
(C) The biochemical energy lost strictly as waste heat purely through the intestinal digestion of complex proteins.
(D) The immediate rapid spike in systemic metabolic energy expenditure following the ingestion of a carbohydrate-rich meal.

**112.** Identify the incorrect statement concerning the factors that affect Basal Metabolic Rate (BMR).
(A) BMR is generally higher in men than in women due to greater lean muscle mass.
(B) BMR steadily increases with advancing age after the age of 30.
(C) Secretion of thyroxine by the thyroid gland significantly increases BMR.
(D) Fevers and acute infections generally cause an increase in BMR.

**113.** According to the revised ICMR-NIN 2020 expert committee guidelines, what are the updated reference body weights for an adult Indian Man and adult Indian Woman, respectively?
(A) 60 kg and 50 kg
(B) 65 kg and 55 kg
(C) 70 kg and 60 kg
(D) 55 kg and 45 kg

NODIA

**114.** Select the correct sequence of daily caloric requirement for an adult Indian male, ordered from the highest required intake to the lowest, based on activity level:
(A) Sedentary Worker → Moderate Worker → Heavy Worker
(B) Heavy Worker → Moderate Worker → Sedentary Worker
(C) Moderate Worker → Heavy Worker → Sedentary Worker
(D) Heavy Worker → Sedentary Worker → Moderate Worker

**115.** The Specific Dynamic Action (SDA), also known as the thermic effect of food, refers to the energy expended by the body to digest, absorb, and metabolize food. Which macronutrient has the highest SDA?
(A) Fats
(B) Carbohydrates
(C) Proteins
(D) Dietary Fiber

**116.** In modern nutritional policy, junk foods are frequently categorized under the acronym HFSS. What does HFSS stand for?
(A) High Fructose Synthetic Sugars

(A) Ministry of Education
(B) Ministry of Health and Family Welfare
(C) Ministry of Women and Child Development
(D) Ministry of Rural Development

**99.** Match the ICDS target beneficiaries in List I with their corresponding focus services in List II:
**List I: (Target Beneficiary)**
P. Pregnant Women
Q. Children aged 3 to 6 years
R. Infants (0 to 6 months)
S. Children aged 6 months to 3 years
**List II: (Focus Service)**
1. Non-formal preschool education
2. Promotion of exclusive breastfeeding
3. Take Home Ration (THR)
4. Tetanus Toxoid immunization and IFA tablets
(A) P-4, Q-3, R-2, S-1
(B) P-2, Q-1, R-4, S-3
(C) P-4, Q-1, R-2, S-3
(D) P-3, Q-1, R-2, S-4

**100.** In the context of the PM POSHAN scheme, what is the primary objective of the "Tithi Bhojan" initiative?
(A) To strictly map and record the exact biological birth date of every enrolled primary school student.
(B) To legally mandate specific religious fasting days across all public government school systems.
(C) To financially penalize students who consistently miss mid-day meals on consecutive academic days.
(D) Encouraging community participation via special meals on festive occasions.

**101.** Food fortification is best defined as:
(A) The agricultural biological process of genetically modifying food crops specifically to increase total harvest yield.
(B) The widespread industrial addition of synthetic chemical preservatives to extend the commercial shelf life of processed foods.
(C) Deliberately adding micronutrients to food to enhance its nutritional quality.
(D) The systematic chemical elimination of naturally occurring anti-nutritional factors from raw grains through prolonged water soaking.

**102.** The Government of India promotes 'Double Fortified Salt' (DFS) through the PDS system. Which two specific micronutrients are added to DFS?
(A) Calcium and Vitamin D
(B) Iron and Iodine
(C) Zinc and Magnesium
(D) Vitamin A and Folic Acid

**103.** Select the sequence that correctly orders the biological value of proteins from highest quality to lowest quality based on human digestion and amino acid profile:
(A) Whole Egg → Cow's Milk → Soybean → Wheat
(B) Wheat → Soybean → Cow's Milk → Whole Egg
(C) Soybean → Whole Egg → Wheat → Cow's Milk
(D) Cow's Milk → Wheat → Whole Egg → Soybean

**104.** Under the FSSAI fortification standards, packaged milk and edible oils in India are primarily fortified with which of the following vitamins?
(A) Vitamins A and D
(B) Vitamins $B_1$ and $B_2$
(C) Vitamins C and K
(D) Vitamin $B_{12}$ and Folate

**105.** "Golden Rice" is a well-known example of biofortification. It has been genetically engineered to biosynthesize beta-carotene, which is a precursor of:
(A) Iron
(B) Vitamin C
(C) Vitamin A
(D) Protein

**106.** The Food Safety and Standards Authority of India (FSSAI) is a statutory body established under which overarching legislative act?
(A) Food Safety and Standards Act, 2006
(B) Prevention of Food Adulteration Act, 1954
(C) Essential Commodities Act, 1955
(D) Consumer Protection Act, 2019

**107.** The FSSAI functions under the administrative control of which Union Ministry?
(A) Ministry of Agriculture and Farmers Welfare
(B) Ministry of Consumer Affairs, Food and Public Distribution
(C) Ministry of Food Processing Industries
(D) Ministry of Health and Family Welfare

Downloaded from www.pdf.tube

# ANSWERS

**1.** (B) Alteration of fundamental genetic sequences within the host genome
Human nutrition encompasses the intake of food to provide essential baseline energy for cellular metabolism, synthesize non-essential amino acids, and regulate various internal physiological processes including immunity. However, dietary nutrients do not alter host genetic sequences. Genomes remain constant regardless of nutritional intake, making structural genome modification entirely distinct from standard biological nutrition functions.

**2.** (B) I and III only
A balanced diet provides essential dietary energy through macronutrients like carbohydrates and fats while incorporating indigestible dietary fiber and water to ensure digestive regularity and bodily hydration. Micronutrients are continuously required for daily biological functioning and metabolic maintenance, rather than solely during times of clinically diagnosed nutrient deficiencies, making adequate baseline intake vital.

**3.** (C) Macronutrients act as co-enzymes in cellular respiration.
Macronutrients encompass bulk dietary carbohydrates, proteins, and lipids required in large quantities to supply structural material and cellular energy. Micronutrients, including vitamins and essential minerals, are needed in minute daily amounts and function as vital co-enzymes or co-factors in respiratory pathways. Macronutrients themselves do not act directly as catalytic co-enzymes in metabolism.

**4.** (D) Assertion (A) is false but Reason (R) is true.
Consuming a balanced diet supports immune cell proliferation, mucosal structural integrity, and targeted antibody production, thereby preserving systemic immune defenses. However, proper dietary nutrition cannot completely guarantee total immunity against all infectious diseases, as exposure to novel or highly virulent pathogens can still cause clinical illness regardless of individual nutritional status and diet.

NODIA

**5.** (B) 55-60% : 10-15% : 20-30%
Standard dietary guidelines for adult Indians recommend deriving fifty-five to sixty percent of daily caloric energy from complex carbohydrates, ten to fifteen percent from high-quality dietary proteins, and twenty to thirty percent from total fats. This balanced caloric distribution provides optimal physiological energy while supporting cellular repair and preventing metabolic chronic disorders.

**6.** (B) Foods providing high energy but minimal essential micronutrients
Empty calories describe food items and beverages that supply high dietary energy through simple sugars or saturated fats while providing negligible amounts of essential vitamins, minerals, dietary fiber, or protein. Regular intake of these nutrient-poor foods contributes to excess daily caloric consumption, increasing the risk of obesity without meeting critical physiological micronutrient requirements.

**7.** (A) II, I, IV, III, V
Human holozoic nutrition follows five sequential physiological stages to utilize dietary organic matter. Food is first taken into the body through ingestion, followed by mechanical and enzymatic digestion into simple soluble molecules. These nutrients undergo intestinal absorption into the bloodstream, are incorporated into cellular structures through assimilation, and indigested remnants are eliminated via egestion.

**8.** (A) The daily intake level meeting requirements of nearly all healthy individuals.
Recommended Dietary Allowance represents the estimated average daily intake level of an essential nutrient that satisfies the complete physiological requirements of nearly all healthy individuals in a given life stage and gender group. It is calculated above the basic requirement threshold to cover population variances and prevent development of chronic subclinical nutrient deficiencies.

**9.** (D) Statement I is incorrect but Statement II is correct
Vitamins and minerals serve protective and regulatory functions without acting as energy-

(B) Heavily Fried Saturated Snacks
(C) Highly Flavored Sodium Snacks
(D) High Fat, Salt, and Sugar

**117.** FSSAI has strictly limited the permissible amount of trans fatty acids in all oils and fats in India. From January 2022 onwards, what is the maximum permitted limit by weight?
(A) 10%
(B) 5%
(C) 2%
(D) 0%

**118.** Identify the correct statement regarding the physiological impact of regular junk food consumption.
(A) It permanently enhances and artificially elevates the body's baseline basal metabolic rate.
(B) It promotes insulin resistance via recurrent blood glucose spikes.
(C) It causes an immediate, rapid, prolonged physiological feeling of satiety due to its high nutrient density.
(D) It actively and continuously lowers circulating systemic low-density lipoprotein (LDL) cholesterol levels.

**119.** The widely accepted "NOVA" classification system groups foods according to the extent and purpose of industrial processing. Under this system, soft drinks, instant noodles, and packaged snacks fall into which category?
(A) Unprocessed foods
(B) Processed culinary ingredients
(C) Processed foods
(D) Ultra-processed foods

**120.** A diet heavily reliant on ultra-processed and junk foods is strongly linked to dysbiosis. In human biology, dysbiosis refers to:
(A) An imbalance in the beneficial microbial community of the human gut.
(B) The sudden pathological calcification and ossification of articular joint cartilage.
(C) The rapid autoimmune destruction of red blood cells leading to severe hemolytic anemia.
(D) Complete physiological failure of the exocrine pancreas to synthesize and secrete digestive enzymes.

**121.** What is the primary biochemical mechanism of action of dietary antioxidants in the human body?
(A) They significantly accelerate the intracellular oxidation of long-chain fatty acids inside mitochondria to produce ATP.
(B) They actively bind with dietary heavy metals to form stable, insoluble chelate complexes within the stomach cavity.
(C) They neutralize free radicals by donating an electron, preventing cellular damage.
(D) They directly target and destroy invading pathogenic bacteria by triggering systemic cell phagocytosis.

**122.** Consider the following statements regarding antioxidants:
**Statement I:** Vitamin C, Vitamin E, and Beta-carotene are critical exogenous antioxidants obtained through diet.
**Statement II:** The human body is entirely incapable of producing its own endogenous antioxidant enzymes, relying 100% on dietary sources.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**123.** Identify the incorrect statement concerning oxidative stress.
(A) Oxidative stress occurs when there is an imbalance between free radical production and antioxidant defenses.
(B) It is linked to the pathogenesis of chronic diseases such as cancer and atherosclerosis.
(C) Environmental pollutants and tobacco smoke can significantly increase oxidative stress.
(D) Consuming deeply fried, oxidized cooking oil effectively cures oxidative stress.

**124.** Which of the following is a correct pair of an antioxidant phytochemical and its richest common dietary source?
(A) Anthocyanin - Butter
(B) Lycopene - Tomatoes
(C) Resveratrol - Refined white sugar
(D) Allicin - Sweet corn

Click Here to Buy book on Flipkart

(B) Infection increases nutrient loss and weakens immunity, escalating malnutrition and further infection.
(C) Excessively high oral intakes of supplemental water-soluble vitamins directly provoke acute pathogenic bacterial infections inside the gut lumen.
(D) Routine broad-spectrum antibiotics prescribed for common pediatric infections directly oxidize and deplete all subcutaneous bodily fat stores.

**71.** The "First 1000 Days of Life" is a critical window heavily targeted by nutritional schemes. Which exact period does this refer to?
(A) From the exact moment of infant birth up to the child's third chronological birthday
(B) From the completion of the child's first birthday up to their fourth chronological birthday
(C) The entire extended preschool development period spanning precisely from age 3 to age 6
(D) From conception through pregnancy until the child's second birthday

**72.** Consider the following types of nutritional anemia:
I. Iron-deficiency anemia
II. Megaloblastic anemia (Vitamin $B_{12}$ / Folate deficiency)
III. Pernicious anemia
Which combination represents anemias caused primarily by dietary micronutrient deficiencies or their malabsorption?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**73.** Which of the following physical symptoms is uniquely characteristic of severe, chronic iron-deficiency anemia?
(A) Spontaneous gingival bleeding
(B) Ocular night blindness
(C) Koilonychia (spoon nails)
(D) Bilateral skeletal bowed legs

**74.** The "Anemia Mukt Bharat" (AMB) strategy utilizes a specific numerical framework to structure its implementation. What is this framework known as?
(A) The 3 x 3 x 3 Strategy
(B) The 4 x 4 x 4 Strategy
(C) The 6 x 6 x 6 Strategy
(D) The 10 x 10 x 10 Strategy

**75.** Under the Weekly Iron and Folic Acid Supplementation (WIFS) programme for school-going adolescent boys and girls, what is the composition of the standard prophylactic blue pill provided?
(A) 20 mg elemental iron and 100 mcg folic acid
(B) 45 mg elemental iron and 400 mcg folic acid
(C) 60 mg elemental iron and 500 mcg folic acid
(D) 100 mg elemental iron and 1000 mcg folic acid

NODIA

**76.** According to the World Health Organization (WHO), a pregnant woman is clinically diagnosed as anemic if her blood hemoglobin concentration drops below what threshold?
(A) 13.0 g/dL
(B) 12.0 g/dL
(C) 11.0 g/dL
(D) 9.0 g/dL

**77.** Identify the incorrect statement regarding the etiology of anemia in India.
(A) Hookworm infestation is a significant contributing factor to intestinal blood loss and subsequent anemia.
(B) Malaria is an infectious cause that can exacerbate anemic conditions through hemolysis.
(C) Excessive consumption of Vitamin C is the leading cause of nutritional anemia.
(D) Poor dietary intake of bioavailable iron is the most widespread primary cause.

**78.** Endemic goiter is fundamentally a physiological adaptation characterized by the hypertrophy of the thyroid gland. This hypertrophy is a compensatory response to the deficiency of:
(A) Dietary calcium
(B) Circulating insulin
(C) Vitamin D
(D) Dietary iodine

**79.** Severe maternal iodine deficiency during pregnancy can result in a devastating condition in the newborn, characterized by irreversible mental retardation and stunted physical growth. This condition is termed:
(A) Cretinism
(B) Infantile marasmus
(C) Adult myxedema
(D) Childhood rickets

**135.** In an effort to counter micronutrient deficiencies through the Public Distribution System (PDS), the Government of Rajasthan frequently supplies fortified wheat flour (atta). Which essential micronutrients are typically added to this fortified atta?
(A) Vitamin C, Calcium, and Zinc
(B) Vitamin D, Iodine, and Potassium
(C) Magnesium, Phosphorus, and Vitamin E
(D) Iron, Folic Acid, and Vitamin $B_{12}$

**136.** What is the primary role of the 'Amrita Haat' organized periodically by the Department of Women and Child Development in Rajasthan?
(A) Empower women SHGs by providing a product market, boosting household nutrition.
(B) To regularly organize and conduct subsidized mass surgical operations for clinical endemic goiter removal across rural districts.
(C) To serve as a high-end commercial marketplace catering exclusively to luxury international imported food products.
(D) To directly distribute free synthetic chemical fertilizers and agricultural pesticides exclusively to smallholder male farmers.

**137.** Which of the following cooking methods causes the highest loss of water-soluble vitamins, particularly Vitamin C and the B-complex vitamins, from green leafy vegetables?
(A) High-pressure atmospheric steaming using minimal water
(B) Rapid low-moisture electronic microwaving in covered glass vessels
(C) Boiling in excess water that is then discarded
(D) Light high-heat stir-frying with minimal oil exposure

**138.** The traditional process of parboiling rice (partially boiling it in the husk) is nutritionally beneficial because:
(A) Drives B-vitamins from bran into the endosperm, preserving them during milling.
(B) It completely eliminates all digestible carbohydrates and starches directly from the rice grains during processing.
(C) It heavily fortifies the structural matrix of raw grain with synthetic lipophilic Vitamin D and Vitamin A supplements.
(D) It renders the rice starches totally indigestible, transforming the whole grain into pure insoluble gastrointestinal roughage.

**139.** Which of the following is considered the most appropriate cooking practice for maximum nutrient retention?
(A) Finely chopping and mincing fresh raw vegetables into exceedingly fine pieces many hours prior to thermal cooking
(B) Washing and soaking sliced vegetables thoroughly in running tap water only after peeling and finely cutting them
(C) Cooking food continuously in an open, uncovered vessel for an extended period of time at high boiling temperatures
(D) Washing prior to cutting and cooking covered with minimal water

**140.** The 'Maillard reaction' is a chemical reaction that occurs during the high-temperature cooking (like baking or roasting) of food. Which two nutritional components interact in this reaction to produce the characteristic browned flavor and color, often at the cost of reducing biological value?
(A) Saturated fats and water
(B) Amino acids and reducing sugars
(C) Calcium and Vitamin C
(D) Dietary fiber and complex starches

www.nodia.in

NODIA

grade, requiring immediate disposal prior to nursing.
(C) It contains predominantly complex dietary carbohydrates while possessing virtually zero biological protein.
(D) It is completely devoid of lipophilic nutrients and lacks essential Vitamin A entirely in all samples.

**89.** The National Nutrition Mission, known as Poshan Abhiyan, was launched on International Women's Day in 2018 by the Prime Minister from which district of Rajasthan?
(A) Jaipur district
(B) Jodhpur district
(C) Jhunjhunu
(D) Udaipur district

**90.** Which of the following is an incorrect statement regarding the specific quantitative targets originally set under Poshan Abhiyan?
(A) Eradicate 100% of childhood anemia within 3 years.
(B) Reduce stunting in children (0-6 years) by 2% per annum.
(C) Reduce under-nutrition (underweight) by 2% per annum.
(D) Reduce low birth weight by 2% per annum.

**91.** Consider the following strategic pillars of Poshan Abhiyan:
I. Inter-sectoral convergence of various ministries
II. Extensive use of Information and Communication Technology (ICT) for real-time monitoring
III. Complete privatization of Anganwadi centers
Which combination represents the actual pillars of the mission?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**92.** Under the Jan Andolan (community mobilization) aspect of Poshan Abhiyan, which month is celebrated annually across India as 'Rashtriya Poshan Maah' (National Nutrition Month)?
(A) Month of March
(B) September
(C) Month of June
(D) Month of December

**93.** What is the standard fund-sharing pattern between the Central Government and the State Government of Rajasthan for the implementation of Poshan Abhiyan?
(A) 50 : 50
(B) 60 : 40
(C) 90 : 10
(D) 100% Centrally Sponsored

**94.** To ensure real-time monitoring of beneficiary nutrition status and Anganwadi service delivery, the Ministry of Women and Child Development replaced earlier registers with which centralized digital application?
(A) Aarogya Setu Mobile App
(B) e-Sanjeevani Portal
(C) Universal U-WIN Platform
(D) Poshan Tracker

**95.** The Integrated Child Development Services (ICDS), one of the world's largest flagship programs for early childhood care and development, was launched in India in which year?
(A) 1975
(B) 1985
(C) 1995
(D) 2005

**96.** Consider the following services provided at Anganwadi centers under ICDS:
I. Supplementary Nutrition
II. Immunization
III. Formal higher secondary education
IV. Referral services
Which combination correctly lists the actual services offered under ICDS?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

**97.** Under the PM POSHAN Scheme (formerly Mid-Day Meal), what is the prescribed nutritional norm per child per school day for primary classes (Class I to V)?
(A) 300 calories and 8 grams of protein
(B) 450 calories and 12 grams of protein
(C) 700 calories and 20 grams of protein
(D) 800 calories and 25 grams of protein

**98.** Which Union Ministry is the nodal agency responsible for the implementation of the PM POSHAN (Mid-Day Meal) scheme across India?

Downloaded from www.pdf.tube

yielding substrates. Carbohydrates and fats represent the primary energy sources in human metabolic pathways. However, when carbohydrate reserves and adipose lipid stores become severely depleted, body tissue proteins can be broken down into amino acids to yield usable physiological cellular energy.

**10.** (A) Ascorbic Acid
Glucose, starch, and triglycerides serve primarily as energy-yielding metabolic substrates in human physiological nutrition. Ascorbic acid functions differently as a water-soluble antioxidant vitamin required for collagen synthesis, immune support, and enzymatic tissue reactions. It does not act as a primary dietary fuel source, rendering its biological functional role distinct from energy molecules.

**11.** (D) Serving as a main source of cellular energy
Carbohydrates function as the primary and most accessible source of physiological energy for human cells. Once digested into glucose, carbohydrates undergo glycolysis and cellular respiration to yield adenosine triphosphate, which fuels vital biological work. Brain tissues and red blood cells rely almost exclusively on circulating glucose to maintain baseline cellular metabolic functions.

**12.** (B) P-2, Q-3, R-1, S-4
Glucose represents a basic simple monosaccharide utilized directly for energy. Sucrose is a disaccharide composed of glucose and fructose units linked together. Glycogen is a complex storage polysaccharide found in animal tissues. Galactose functions as a monosaccharide constituent of milk sugar lactose, establishing the exact structural classification for each distinct carbohydrate molecule.

**13.** (C) Liver and skeletal muscles
When daily dietary carbohydrate consumption exceeds immediate metabolic cellular demands, excess circulating glucose is converted into glycogen through glycogenesis. This storage polysaccharide is retained primarily within the liver and skeletal muscle tissues. Liver glycogen helps maintain systemic blood glucose homeostasis during fasting, whereas muscle glycogen provides localized energy for muscular contraction during physical activity.

NODIA

**14.** (D) Induction of ketosis from incomplete fat breakdown
Severe long-term carbohydrate deprivation forces the human body to mobilize stored adipose lipids for cellular energy generation. In the absence of sufficient carbohydrate-derived oxaloacetate, hepatic beta-oxidation produces acetyl-CoA faster than the citric acid cycle can process it. Excess acetyl-CoA molecules convert into ketone bodies, leading to systemic physiological ketosis as an alternative fuel source.

**15.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Humans cannot harvest metabolic energy from dietary cellulose because human digestive secretions lack the enzyme cellulase needed to cleave beta-1,4-glycosidic bonds linking glucose monomers in cellulose. Consequently, cellulose passes unhydrolyzed through the human gastrointestinal tract, acting strictly as insoluble dietary fiber or roughage rather than an energy-supplying carbohydrate source.

**16.** (B) Maltose
Complex carbohydrates, or polysaccharides, consist of long polymeric chains of monosaccharide units joined by glycosidic bonds, as seen in amylose, cellulose, and chitin. Maltose is a disaccharide composed of only two glucose molecules linked together. Therefore, maltose is classified as a simple carbohydrate rather than a complex polysaccharide in nutritional biochemistry.

**17.** (B) Amino acids
Proteins are organic macromolecules constructed from linear chains of basic building blocks called amino acids linked together by peptide bonds. Each amino acid possesses an amine group, a carboxyl group, and a unique side chain. The specific sequence of these amino acids determines the biological tertiary structure and functional activity of each synthesized protein.

**18.** (A) I and III only
Kwashiorkor is characterized by distinct clinical features including severe generalized edema caused by hypoalbuminemia, skin changes, and an enlarged fatty liver resulting from impaired hepatic lipid transport. Conversely, extreme muscle wasting giving a skin-and-bones appearance and onset in infants under one year

**57.** (C) Prevention of constipation by increasing fecal bulk and reducing transit time
Insoluble dietary fiber absorbs water and increases stool mass within the intestinal lumen. This mechanical bulk stimulates colonic peristalsis, promoting regular bowel movements and significantly reducing gastrointestinal transit time. These physical actions prevent constipation and decrease intraluminal pressure, reducing the risk of functional intestinal disorders like diverticulosis and hemorrhoids.

**58.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Dietary fiber is essential for maintaining human health despite supplying minimal metabolic energy. Insoluble fiber increases fecal bulk and accelerates transit time, preventing digestive stagnation. Meanwhile, soluble fiber undergoes fermentation by colonic bacteria, yielding short-chain fatty acids that nourish enterocytes and support a healthy colonic microbiome, directly supporting gut function.

**59.** (D) Whole grains and vegetables
Consuming diets rich in whole grains, vegetables, and legumes provides abundant dietary fiber, which increases fecal volume and softens stool consistency. This reduces intracolonic pressure during peristalsis, preventing mucosal herniation through muscular wall layers. Consequently, high fiber intake serves as an effective dietary strategy to prevent diverticular disease of the colon.

**60.** (B) It helps lower cholesterol by binding to intestinal bile acids.
Soluble dietary fiber forms a viscous gel within the small intestine, binding bile acids and promoting their excretion in feces. To synthesize new bile acids, the liver increases uptake of circulating LDL cholesterol, effectively lowering blood cholesterol levels. Soluble fiber also delays gastric emptying, dampening postprandial blood glucose spikes after meals.

**61.** (C) Coexistence of undernutrition alongside overweight, obesity, or diet-related non-communicable diseases.
The double burden of malnutrition refers to the concurrent presence of undernutrition, such as stunting, wasting, or micronutrient deficiencies, alongside overweight, obesity, or diet-related non-communicable diseases within individuals, households, or populations. This public health challenge reflects rapid dietary transitions where energy-dense nutrient-poor foods coexist with persistent undernutrition across developing societies.

**62.** (B) III, I, IV, II
Underweight corresponds to a body mass index under 18.5 $kg/m^2$, covering a defined lower range. Normal weight spans 18.5 to 24.9 $kg/m^2$, representing a 6.4-unit range. Overweight covers 25.0 to 29.9 $kg/m^2$, spanning a 4.9-unit range. Obese Class I covers 30.0 to 34.9 $kg/m^2$, creating a 4.9-unit span.

**63.** (A) Wasting is permanent, while stunting is rapidly cured with high calories.
Stunting reflects chronic or recurrent undernutrition that impairs linear height growth over time, whereas wasting indicates acute severe weight loss resulting from recent starvation or illness. Wasting can be treated relatively quickly with therapeutic nutritional feeding, whereas long-term linear stunting is difficult to reverse fully once early childhood developmental windows pass.

**64.** (B) Deficiency of vitamins and minerals despite adequate caloric intake.
Hidden hunger describes a form of undernutrition where individuals consume sufficient calories to satisfy basic energy requirements, but fail to obtain adequate amounts of essential micronutrients like iron, iodine, zinc, and vitamins. Because clinical signs may remain unnoticed initially, micronutrient deficiencies can silently impair immune function, physical growth, and cognitive development.

**65.** (B) MUAC (Mid-Upper Arm Circumference) tape
Mid-Upper Arm Circumference tape is a flexible, color-coded measuring tool used for rapid field screening of Severe Acute Malnutrition in young children aged six to fifty-nine months. A MUAC reading below 115 millimeters indicates severe muscle wasting and tissue depletion, allowing health workers to identify children requiring immediate nutritional interventions.

**66.** (A) A marginal decline, hovering near 35.5% nationally
According to National Family Health Survey data, childhood stunting in India showed a

Click Here to Buy book on Amazon

**28.** (B) Cholesterol - Precursor for Vitamin D and steroid hormone synthesis
Cholesterol is a vital lipid sterol in human biology, serving as an essential structural component of cell membranes to modulate fluidity. Biochemically, cholesterol acts as the indispensable metabolic precursor for the synthesis of steroid hormones, bile acids, and cutaneous vitamin D, rather than functioning as a structural wall component in plants or digestive enzyme.

**29.** (C) Vitamin A, Vitamin D, Vitamin E, Vitamin K
Vitamins are categorized based on their solubility properties into water-soluble and fat-soluble groups. Vitamins A, D, E, and K are fat-soluble compounds that require dietary lipids and bile salts for proper intestinal absorption. They are stored in hepatic and adipose tissues, whereas Vitamin C and the B-complex vitamins are water-soluble and excreted.

**30.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Water-soluble vitamins are not stored in significant quantities within body tissues, with Vitamin $B_{12}$ being the primary exception stored in the liver. Because excess plasma levels of water-soluble vitamins readily pass through renal filtration and exit via urine, daily dietary replenishment is essential to prevent rapid depletion and maintain adequate metabolic coenzyme pools.

**31.** (A) Vitamin A and Vitamin D
Fat-soluble vitamins, particularly Vitamin A and Vitamin D, are stored extensively in hepatic tissue and body fat reserves. Because the human body cannot rapidly excrete surplus fat-soluble vitamins through urine, excessive chronic or acute intake can lead to accumulation in tissue stores, resulting in clinical toxicity, a state known as hypervitaminosis.

**32.** (B) Function as coenzymes in cellular metabolic reactions
The B-complex vitamins function primarily as vital precursors for coenzymes in intracellular metabolic pathways. They participate directly in carbohydrate, lipid, and amino acid metabolism, enabling key biological processes such as glycolysis, the citric acid cycle, and electron transport. They do not yield direct caloric energy or form structural lipid membrane matrices.

**33.** (D) Statement I is incorrect but Statement II is correct
Scurvy is a clinical deficiency disease caused by a lack of ascorbic acid, which is a water-soluble vitamin rather than a fat-soluble compound. Vitamin C functions as an essential cofactor required for the enzymatic hydroxylation of proline and lysine residues, enabling cross-linking and structural maturation of collagen fibers in connective tissues.

**34.** (A) Casimir Funk
The term "vitamine" was introduced in 1912 by Polish biochemist Casimir Funk after he isolated an amine-containing micronutrient that cured beriberi. He hypothesized that several dietary organic compounds were vital for life and contained nitrogenous amines. Although many vitamins lack amine structures, the modified term "vitamin" remains the universal designation for these micronutrients.

**35.** (C) P-3, Q-4, R-1, S-2
Vitamin $B_1$ is chemically designated as thiamine, which prevents beriberi. Vitamin $B_2$ is riboflavin, an essential component of flavin coenzymes. Vitamin $B_3$ is known as niacin, crucial for cellular NAD/NADP synthesis. Vitamin C is ascorbic acid, a key antioxidant and collagen cofactor, matching each micronutrient with its standard systemic chemical nomenclature.

**36.** (B) Night blindness → Conjunctival xerosis → Bitot's spots → Keratomalacia
Vitamin A deficiency progresses through distinct clinical ocular stages. The earliest sign is night blindness caused by impaired rhodopsin regeneration. Continued deficiency leads to conjunctival xerosis, characterized by mucosal dryness, followed by Bitot's spots forming keratinized plaques. Advanced uncorrected deficiency results in corneal melting and irreversible blindness, a condition known as keratomalacia.

**37.** (C) It enhances the gastrointestinal absorption of non-heme iron.
Ascorbic acid reduces insoluble ferric iron to soluble ferrous iron within the intestinal lumen, significantly enhancing non-heme iron absorption. Vitamin C is heat-labile and easily destroyed by prolonged boiling. Its deficiency leads to scurvy rather than pellagra, and human gastrointestinal

NODIA

microbiota do not produce significant quantities of ascorbic acid for physiological use.

**38.** (B) 7-dehydrocholesterol
Cutaneous synthesis of Vitamin D begins when ultraviolet B solar radiation penetrates the epidermal layers of the skin. Radiation photolyzes 7-dehydrocholesterol, a precursor derived from cholesterol metabolism, converting it into previtamin D3. This intermediate undergoes thermal isomerization to produce cholecalciferol, which subsequently undergoes dual enzymatic hydroxylations in the liver and kidneys.

**39.** (D) Vitamin K
Vitamin K functions as an essential cofactor for the gamma-glutamyl carboxylase enzyme in the liver. This enzymatic reaction carboxylates specific glutamate residues on blood clotting proteins, including prothrombin and factors VII, IX, and X. Carboxylation enables these coagulation factors to bind calcium ions, facilitating efficient blood clotting pathways following vascular injury.

**40.** (A) Intrinsic factor
Vitamin $B_{12}$ absorption requires intrinsic factor, a glycoprotein secreted by gastric parietal cells. In the stomach and small intestine, intrinsic factor binds cobalamin to form a protective complex. This complex travels to the terminal ileum, where specific enterocyte receptors recognize intrinsic factor, facilitating active receptor-mediated endocytosis of Vitamin $B_{12}$ into systemic circulation.

**41.** (C) Pellagra (Niacin deficiency)
The classic triad of diarrhea, dermatitis, and dementia uniquely characterizes pellagra, a disease resulting from severe deficiency of niacin (Vitamin $B_3$) or its precursor amino acid, tryptophan. Left untreated, pellagra can progress to death. It typically affects populations consuming diets predominantly based on untreated corn or maize, which lack bioavailable niacin.

**42.** (A) Fetal neural tube defects
Adequate folate intake during the periconceptional period is crucial for embryonic neural tube closure during early gestation. Deficiencies in folic acid interfere with DNA synthesis and cellular division, significantly increasing the risk of structural congenital malformations such as spina bifida and anencephaly. Public health guidelines mandate periconceptional folic acid supplementation to prevent these defects.

**43.** (D) Vitamin D
Vitamin D undergoes activation to form calcitriol, which regulates intestinal calcium absorption and systemic bone mineralization. Calcitriol binds nuclear Vitamin D receptors in enterocytes, inducing synthesis of calcium-binding proteins like calbindin. Adequate active Vitamin D levels ensure proper intestinal calcium transport, maintaining plasma calcium homeostasis and enabling normal skeletal bone deposition.

**44.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Consuming citrus juices containing ascorbic acid alongside vegetarian meals enhances non-heme iron bio-availability. Ascorbic acid reduces ferric iron into the more soluble ferrous form within the acidic environment of the stomach. Ferrous iron readily remains dissolved in the duodenum, facilitating efficient uptake by enterocyte transport proteins and improving systemic iron status.

**45.** (C) Thyroid gland
Dietary iodine is actively taken up by thyroid follicular cells to synthesize essential thyroid hormones, namely thyroxine and triiodothyronine. These iodine-containing hormones regulate basal metabolic rate, protein synthesis, thermogenesis, and tissue growth throughout the body. Inadequate dietary iodine intake impairs hormone production, leading to compensatory enlargement of the thyroid gland.

**46.** (D) Zinc
Zinc functions as an essential catalytic or structural cofactor for over three hundred metallic enzymes involved in DNA synthesis, cellular immunity, and tissue growth. Additionally, zinc plays a direct role in maintaining gustatory and olfactory receptor function, making adequate zinc intake necessary for normal taste and smell perception alongside immune system maintenance.

**47.** (A) P-2, Q-4, R-1, S-3
Iron deficiency impairs hemoglobin synthesis, resulting in microcytic anemia. Chronic calcium deficiency causes bone density loss, leading to

Downloaded from www.pdf.tube

adult osteoporosis. Iodine deficiency restricts thyroid hormone production, producing thyroid gland enlargement known as goiter. Zinc deficiency impairs cellular proliferation, causing severe growth retardation and compromised immune function in affected individuals.

**48.** (B) Optimal levels prevent dental caries, whereas excess leads to fluorosis.
Fluoride is monitored in drinking water because trace concentrations incorporate into tooth enamel to form fluorapatite, which resists acid decay and prevents dental caries. However, chronic excessive intake during enamel development causes dental fluorosis, characterized by tooth mottling, and prolonged high intake can lead to skeletal fluorosis with severe joint stiffness.

**49.** (C) I, II, III, and IV
Macrominerals, or major minerals, are required by adult human bodies in daily amounts exceeding one hundred milligrams. Sodium, potassium, calcium, and phosphorus all fall into this major mineral category. They perform critical roles in electrolyte balance, fluid volume maintenance, cell membrane potential generation, structural bone mineral matrix formation, and cellular energy transfer.

**50.** (A) The sodium-potassium pump transports sodium inside and potassium outside to yield ATP.
The sodium-potassium ATPase pump utilizes ATP energy to actively transport three sodium ions out of the cell and two potassium ions into the cell, consuming ATP rather than generating it. Sodium serves as the primary extracellular cation, potassium acts as the main intracellular cation, and chloride functions as the chief extracellular anion.

**51.** (C) 55 - 65%
Water constitutes the most abundant chemical component of the human body, accounting for approximately fifty-five to sixty-five percent of total body weight in a healthy adult. Exact percentages vary based on age, gender, and adiposity, as lean muscle tissue contains significantly higher fluid content than adipose tissue reserves throughout the body.

**52.** (A) I and II only
Water acts as a universal biological solvent that dissolves metabolites and enables biochemical reactions across fluid compartments. It also regulates body temperature through the evaporation of sweat from skin surfaces. However, water contains no digestible macronutrients and yields zero direct caloric energy, making caloric provision completely absent from its physiological functions.

**53.** (C) Antidiuretic hormone (ADH)
Antidiuretic hormone, also known as vasopressin, is synthesized in the hypothalamus and released by the posterior pituitary gland in response to increased plasma osmolality. ADH acts on renal collecting ducts, increasing aquaporin channel insertion to promote water reabsorption. This mechanism conserves bodily fluids and helps maintain systemic fluid volume and osmotic balance.

**54.** (B) Unnoticed water loss via skin diffusion and exhalation
Insensible water loss refers to continuous, unnoticed fluid loss that occurs without conscious awareness or active sweat gland secretion. It occurs primarily through water vapor exhalation from respiratory mucosal membranes and direct transepidermal water diffusion across skin layers. Unlike sensible sweating or urinary excretion, insensible fluid loss cannot be directly regulated by vasopressin.

NODIA

**55.** (D) Total caloric expenditure and surface area
Daily baseline fluid requirements correlate closely with total energy expenditure and body surface area. Heat produced during metabolic processes requires water for dissipation through respiration and cutaneous evaporation. Generally, adults require approximately one milliliter of water per kilocalorie of energy expended to balance metabolic water turn-over and maintain normal physiological hydration status.

**56.** (A) P-1, Q-2, R-3, S-4
Cellulose is an insoluble structural polysaccharide in plant walls. Pectin is a soluble fiber in fruits that forms gel matrices. Lignin represents a non-carbohydrate woody polymer that resists digestion. Mucilage is a soluble, viscous seed fiber like psyllium that swells in fluid, accurately matching each dietary fiber to its physiological properties.

under six years old, pregnant women, and lactating mothers across India.

**96.** (B) I, II, and IV only
Integrated Child Development Services provides a package of six core services: supplementary nutrition, immunization, health check-ups, referral services, non-formal preschool education for young children, and nutrition education for mothers. Formal higher secondary education falls outside the scope of ICDS, which focuses on early childhood care and maternal health support.

**97.** (B) 450 calories and 12 grams of protein
Under PM POSHAN guidelines, cooked mid-day meals provided to primary school children in classes 1 through 5 must supply at least 450 kilocalories and 12 grams of protein per child each school day. This targeted nutritional standard helps address calorie-protein deficits, supporting healthy growth and concentration in young students.

**98.** (A) Ministry of Education
The Ministry of Education, formerly known as the Ministry of Human Resource Development, serves as the central nodal agency responsible for managing the PM POSHAN Scheme. The ministry establishes implementation guidelines, allocates federal budgets, and works with state education departments to ensure daily meal delivery in public and aided schools nationwide.

**99.** (C) P-4, Q-1, R-2, S-3
Pregnant women receive tetanus toxoid immunizations and folic acid tablets at Anganwadi centers. Children aged three to six years participate in non-formal preschool activities. Infants up to six months are supported through maternal promotion of exclusive breastfeeding, while young children aged six months to three years receive Take Home Rations.

**100.** (D) Encouraging community participation via special meals on festive occasions.
The Tithi Bhojan initiative within the PM POSHAN scheme encourages local community members to contribute supplementary food or special meals to school children during personal celebrations, festivals, or family events. This voluntary program fosters public involvement in public education, enhances meal variety, and strengthens social bonding between local communities and public schools.

**101.** (C) Deliberately adding micronutrients to food to enhance its nutritional quality.
Food fortification involves deliberately increasing the content of essential micronutrients, such as vitamins and minerals, in commonly consumed staple foods. This public health strategy aims to improve the nutritional quality of food supplies, helping prevent subclinical micronutrient deficiencies across populations without requiring changes in existing dietary habits or daily intake patterns.

**102.** (B) Iron and Iodine
Double Fortified Salt is edible table salt fortified with both iron and iodine. Developed as a public health intervention, DFS supplies two essential trace minerals in daily meals. Regular consumption helps simultaneously combat iron-deficiency anemia and iodine deficiency disorders across vulnerable populations relying on the public distribution system.

**103.** (A) Whole Egg → Cow's Milk → Soybean → Wheat
Whole egg protein possesses a high biological value near 100, serving as a standard for complete essential amino acid balances. Cow's milk protein exhibits slightly lower biological availability, followed by high-quality plant proteins like soybean. Cereal proteins, such as wheat, have lower biological value due to limiting amino acids like lysine.

**104.** (A) Vitamins A and D
Food Safety and Standards Authority of India guidelines specify that commercial packaged milk and edible vegetable oils are fortified with fat-soluble Vitamins A and D. Because these food staples contain natural lipid matrices, adding these micronutrients improves population intake, helping address widespread subclinical deficiencies in Vitamin A and Vitamin D.

**105.** (C) Vitamin A
Golden Rice is a genetically engineered crop designed to synthesize beta-carotene within its edible endosperm tissue. Beta-carotene is a provitamin carotenoid that human intestinal enterocytes convert into active Vitamin A (retinol). Developing Golden Rice offers an

Click Here to Buy book on Flipkart

modest decline from 38.4% in NFHS-4 to 35.5% in NFHS-5. Although this represents gradual progress in addressing chronic undernutrition, stunting rates remain high across many states, highlighting the ongoing need for targeted maternal and child health interventions.

**67.** (A) I, II, and III only
Severe Acute Malnutrition in pediatric populations is diagnosed using World Health Organization criteria: a weight-for-height Z-score below -3 standard deviations, a mid-upper arm circumference under 115 mm, or the presence of bilateral pitting edema. A body mass index above 30 indicates adult obesity rather than pediatric malnutrition.

**68.** (D) Anganwadi Centre
Anganwadi centres operate as village-level hubs established under the Integrated Child Development Services program. Staffed by Anganwadi workers, these community centres deliver essential health services, including supplementary nutrition, immunization monitoring, growth tracking, and non-formal preschool education for young children, pregnant women, and nursing mothers across rural and urban communities.

**69.** (C) PM POSHAN Scheme
The National Programme of Mid-Day Meals in Schools was revamped and officially renamed the PM POSHAN Scheme. This initiative provides cooked mid-day meals to eligible primary and upper primary school children across India. The scheme aims to improve nutritional status, encourage regular school attendance, and enhance learning outcomes among underprivileged children.

**70.** (B) Infection increases nutrient loss and weakens immunity, escalating malnutrition and further infection.
The malnutrition-infection cycle is a compounding interaction where inadequate nutritional intake impairs immune responses and mucosal barriers, increasing susceptibility to infectious diseases. Simultaneously, infections cause anorexia, intestinal nutrient malabsorption, and increased metabolic breakdown, which further worsens nutritional status and leaves the host vulnerable to recurrent, severe secondary infections.

**71.** (D) From conception through pregnancy until the child's second birthday
The first 1000 days of life span the 270 days of prenatal pregnancy plus the 730 days across the child's first two years after birth. Adequate nutrition during this developmental window is essential for brain growth, immune system development, and long-term metabolic health, reducing risks of permanent stunting and cognitive deficits.

**72.** (D) I, II, and III
Nutritional anemias stem from deficiencies or malabsorption of key micronutrients needed for erythrocyte formation. Iron deficiency impairs functional hemoglobin synthesis. Folate and Vitamin $B_{12}$ deficiencies disrupt DNA replication, causing megaloblastic anemia. Pernicious anemia specifically results from impaired $B_{12}$ absorption due to a lack of gastric intrinsic factor, disrupting normal erythropoiesis.

**73.** (C) Koilonychia (spoon nails)
Koilonychia, characterized by abnormally thin, concave fingernails with raised edges, is a distinctive physical sign of severe chronic iron-deficiency anemia. It occurs because iron depletion impairs essential cellular iron-containing enzymes in the nail matrix. Other listed symptoms stem from different deficiencies, such as scurvy, Vitamin A deficiency, or Vitamin D deficiency.

**74.** (C) The 6 x 6 x 6 Strategy
The Anemia Mukt Bharat campaign utilizes a 6x6x6 strategic framework designed to accelerate anemia reduction across India. This approach targets six beneficiary age groups, provides six standardized interventions, and relies on six institutional mechanisms. This organized structure ensures coordinated multi-sectoral execution across health sectors, educational institutions, and community outreach channels nationwide.

**75.** (C) 60 mg elemental iron and 500 mcg folic acid
Under the Weekly Iron and Folic Acid Supplementation program, adolescent boys and girls in schools receive a weekly prophylactic blue tablet. Each tablet contains 60 mg of elemental iron alongside 500 mcg of folic acid. This supplementation regimen helps prevent iron-deficiency anemia, supporting rapid growth and development during adolescence.

Downloaded from www.pdf.tube

**76.** (C) 11.0 g/dL
According to World Health Organization diagnostic standards, pregnant women are considered anemic if their venous hemoglobin concentration falls below 11.0 grams per deciliter during any trimester. Physiological plasma volume expansion during pregnancy creates hemodilution, lowering normal baseline hemoglobin thresholds compared to non-pregnant women, who have a cutoff threshold of 12.0 g/dL.

**77.** (C) Excessive consumption of Vitamin C is the leading cause of nutritional anemia.
Vitamin C enhances the absorption of non-heme iron in the intestinal tract, helping reduce the incidence of nutritional anemia rather than causing it. In India, iron-deficiency anemia is driven primarily by low dietary intake of bioavailable iron, parasitic hookworm infections causing intestinal blood loss, and malaria-induced destruction of circulating red blood cells.

**78.** (D) Dietary iodine
Endemic goiter is a compensatory physical hypertrophy of the thyroid gland resulting from persistent dietary iodine deficiency. When circulating iodine levels fall, the thyroid cannot synthesize adequate thyroxine, triggering increased pituitary secretion of thyroid-stimulating hormone. TSH stimulation causes hyperplastic enlargement of thyroid follicular tissue to trap available trace iodine from blood.

**79.** (A) Cretinism
Severe maternal iodine deficiency during early pregnancy impairs fetal thyroid hormone synthesis, causing congenital hypothyroidism. This deficiency damages neurological development and tissue growth, resulting in cretinism. Affected infants display irreversible intellectual disability, short stature, deaf-mutism, and motor dysfunction, highlighting the importance of prenatal iodine adequacy for maternal and child health.

**80.** (B) Universal Salt Iodization (USI) program
Universal Salt Iodization serves as India's primary strategy to eliminate iodine deficiency disorders nationwide. By mandating the addition of potassium iodate to all edible salt intended for household consumption, the government ensures a low-cost, effective, and continuous supply of dietary iodine to diverse populations, successfully reducing endemic goiter and cretinism.

NODIA

**81.** (A) Both Statement I and Statement II are correct
Goitrogens are naturally occurring dietary compounds, such as glucosinolates and cyanogenic glycosides, that inhibit iodine uptake or interfere with thyroid hormone synthesis. Cruciferous vegetables like cabbage and cauliflower, as well as cassava, contain these substances. Regular consumption of raw goitrogenic foods can impair thyroid function, particularly when dietary iodine is low.

**82.** (A) Marine fish and seaweed
Marine organism foods, including saltwater fish, shellfish, and edible seaweeds, are naturally rich dietary sources of iodine. Marine life absorbs and concentrates iodine naturally present in ocean water. In contrast, land-based crops contain variable iodine concentrations that depend heavily on the mineral content of local agricultural soils and irrigation water.

**83.** (B) +350 kcal
According to ICMR-NIN 2020 dietary guidelines, a pregnant woman in her second or third trimester requires an additional 350 kilocalories per day above non-pregnant baseline requirements. This extra energy supports expanded maternal blood volume, placental development, uterine tissue growth, and rapid fetal tissue growth during later stages of pregnancy.

**84.** (B) 6 months
The World Health Organization recommends exclusive breastfeeding for the first six months of an infant's life. During this period, breast milk provides essential nutrients, growth factors, and immunological protection, fulfilling all fluid and nutritional requirements without the need for supplementary water, milks, or solid foods, thereby reducing infant infection risks.

**85.** (C) Gradual introduction of solid foods alongside continued breastfeeding.
Complementary feeding refers to introducing nutrient-dense solid or semi-solid foods alongside continued breastfeeding starting at six months of age. As infants grow, breast milk alone no longer fully meets increasing energy, iron, and zinc requirements. Complementary foods bridge

this nutritional gap while supporting oral motor development and gradual dietary diversification.

**86.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Aging is frequently accompanied by gastric mucosal atrophy, which leads to reduced stomach acid production, a condition known as achlorhydria. Gastric acid is necessary to cleave Vitamin $B_{12}$ from dietary proteins and reduce non-heme iron for absorption, so age-related achlorhydria impairs nutrient bioavailability even when dietary intake appears adequate.

**87.** (A) I, II, and III only
Adolescent girlhood is marked by pubertal growth spurts that increase demands for calories and protein. The onset of menstruation increases systemic iron losses, raising the risk of anemia. Social pressures regarding body image can also increase susceptibility to eating disorders. Bone density loss occurs primarily in older adults rather than adolescent girls.

**88.** (A) It is rich in Secretory IgA antibodies, granting passive immunity to infants.
Colostrum is the initial thick, yellowish fluid secreted by mammary glands immediately following delivery. It contains high concentrations of immunoglobulins, particularly Secretory IgA, which line the infant's gastrointestinal tract to provide early passive immunity against pathogens. Colostrum is also rich in protein, fat-soluble vitamins, and essential trace minerals.

**89.** (C) Jhunjhunu
The Prime Minister launched Poshan Abhiyaan, the National Nutrition Mission, on International Women's Day in March 2018 from Jhunjhunu district in Rajasthan. The scheme aims to reduce stunting, undernutrition, anemia, and low birth weight across India through targeted technology platforms, inter-sectoral convergence, and multi-ministerial community mobilization initiatives nationwide.

**90.** (A) Eradicate 100% of childhood anemia within 3 years.
Poshan Abhiyaan established specific quantitative targets to reduce stunting, underweight, and low birth weight by 2% per year, and set a goal to reduce anemia among young children, adolescent girls, and women by 3% per year. Complete eradication of childhood anemia within three years was not listed among its official operational targets.

**91.** (A) I and II only
The operational foundation of Poshan Abhiyaan rests on inter-sectoral convergence across related government ministries and the deployment of information technology for real-time monitoring through digital tools. Privatization of Anganwadi centers is not a component of the program; these centers remain public community institutions providing grassroots nutrition and health services.

**92.** (B) September
Every year, the month of September is celebrated nationwide as Rashtriya Poshan Maah under Poshan Abhiyaan. During this month, government departments, community organizations, and local institutions organize nutrition awareness rallies, health screenings, and educational workshops to promote maternal, infant, and child nutrition through widespread community participation across India.

**93.** (B) 60 : 40
For most Indian states, including Rajasthan, Poshan Abhiyaan operates under a 60:40 fund-sharing arrangement between the Central Government and State Governments. The Union Government contributes sixty percent of the program's budget, while the state covers forty percent. This shared financial model supports digital tracking tools, capacity building, and community mobilization programs.

**94.** (D) Poshan Tracker
The Ministry of Women and Child Development introduced Poshan Tracker, a centralized mobile application, to replace physical paper registers at Anganwadi centers. This digital tool enables Anganwadi workers to enter real-time data on growth monitoring, supplementary nutrition distribution, and health services, supporting transparent tracking of maternal and child beneficiaries nationwide.

**95.** (A) 1975
The Integrated Child Development Services scheme was officially launched on October 2, 1975, co-inciding with the 106th birth anniversary of Mahatma Gandhi. Designed as a early childhood care intervention, ICDS addresses early health, nutrition, and development needs for children

Click Here to Buy book on Amazon

are typical clinical manifestations of Marasmus rather than Kwashiorkor.

**19.** (C) Essential amino acids must be obtained through diet as the body cannot synthesize them. Essential amino acids cannot be synthesized internally by human physiological pathways at rates sufficient to meet metabolic demands, necessitating their regular intake through dietary sources. Non-essential amino acids are equally required for cellular protein synthesis but can be produced endogenously. Out of twenty standard amino acids, nine are classified as essential for humans.

**20.** (D) Soybeans
Soybeans are recognized as a plant food source providing complete protein because they contain all nine essential amino acids in proportions required for human nutrition. While most plant sources lack sufficient quantities of specific essential amino acids like methionine or lysine, soybean protein matches the biological quality of animal proteins, supporting tissue growth and repair.

**21.** (C) Nitrogen
Carbohydrates and lipids consist purely of carbon, hydrogen, and oxygen atoms in varying structural configurations. Proteins uniquely incorporate nitrogen within their amine functional groups, forming the amine backbone of amino acid building blocks. Certain amino acids also contain sulfur, but nitrogen remains the defining chemical element differentiating structural and functional proteins from other macronutrients.

**22.** (B) Carbohydrates preserve proteins for tissue synthesis instead of energy oxidation.
The protein-sparing action of carbohydrates occurs when adequate dietary carbohydrates supply the body's energy requirements, preventing amino acids from being deaminated and oxidized for metabolic fuel. This allows amino acids and proteins to be conserved for structural tissue repair, growth, enzyme synthesis, and other essential non-energetic biological functions within human physiological systems.

**23.** (A) I and II only
Saturated fatty acids lack carbon-carbon double bonds, forming straight molecular chains that pack tightly and remain solid at room temperature. Unsaturated fatty acids contain double bonds, producing bends that keep them liquid at room temperature. Polyunsaturated fats generally improve serum lipid profiles rather than universally lowering high-density lipoprotein cholesterol to dangerous clinical levels.

**24.** (A) Essential fatty acids not synthesized by humans
Linoleic acid and alpha-linolenic acid are essential polyunsaturated fatty acids that human tissues cannot synthesize internally due to the lack of specific desaturase enzymes. They must be ingested through dietary sources such as plant oils, nuts, and seeds to support cell membrane structure, prostaglandin synthesis, and systemic inflammatory regulation throughout the body.

**25.** (C) They decrease LDL cholesterol and increase HDL cholesterol levels.
Trans fats are created industrially during partial hydrogenation of liquid oils, which alters their molecular double-bond configuration. Consumption of trans fats adversely affects blood lipid levels by significantly elevating harmful low-density lipoprotein cholesterol while simultaneously lowering protective high-density lipoprotein cholesterol, thereby increasing long-term cardiovascular disease risks rather than lowering overall vascular risks.

NODIA

**26.** (C) 9 kcal
Complete metabolic oxidation of dietary lipids produces approximately nine kilocalories of energy per gram, making fats the most energy-dense macro-nutrient. In comparison, carbohydrates and proteins yield roughly four kilocalories per gram. This concentrated energy density allows lipids to serve efficiently as long-term energy reserves stored within adipose tissue throughout the body.

**27.** (D) Triglycerides
Surplus dietary lipids consumed beyond immediate metabolic demands are stored predominantly in adipocytes in the chemical form of triglycerides. A triglyceride molecule consists of a glycerol backbone esterified to three fatty acid chains. This neutral lipid form allows dense, water-free energy storage inside adipose tissue reserves, providing metabolic fuel during prolonged fasting.

agricultural approach to combat dietary Vitamin A deficiency in populations reliant on rice staples.

**106.** (A) Food Safety and Standards Act, 2006
The Food Safety and Standards Authority of India is a statutory regulatory body established under the Food Safety and Standards Act of 2006. This legislation consolidated older food regulations to establish unified science-based standards for food manufacturing, storage, distribution, sale, and import, ensuring food safety across domestic commercial markets.

**107.** (D) Ministry of Health and Family Welfare
The Food Safety and Standards Authority of India operates under the administrative authority of the Union Ministry of Health and Family Welfare. The ministry provides executive oversight, appoints food safety leadership, and coordinates national public health initiatives with FSSAI to protect consumer health and regulate commercial food safety standards across India.

**108.** (A) I, II, and III only
Repeated high-temperature frying degrades cooking oil, forming toxic Total Polar Compounds that increase cardiovascular risks. FSSAI mandates a maximum limit of 25% TPC for edible cooking oils. The RUCO initiative collects discarded oils from commercial kitchens to produce biodiesel, discouraging vendors from repeatedly re-using degraded oils.

**109.** (C) Transforming the food system to ensure safe, healthy, sustainable food for all.
The Eat Right India movement, spearheaded by FSSAI, aims to transform the nation's food ecosystem to ensure access to safe, healthy, and sustainable food for all citizens. Built on the pillars of "Eat Safe", "Eat Healthy", and "Eat Sustainably", the initiative promotes reduced intake of salt, sugar, and trans fats.

**110.** (A) III, II, IV, I
When a Food Safety Officer suspects food adulteration, proper procedure requires taking a sample of the food item in the presence of witnesses. The officer seals and submits the sample to an accredited food laboratory. After receiving the analyst's report confirming adulteration, formal legal prosecution or adjudication is initiated against violators.

**111.** (A) Minimum energy needed to maintain basal vital functions while resting, awake, and fasting.
Basal Metabolic Rate measures the minimum energy expenditure needed to maintain vital physiological processes—such as breathing, circulation, cellular transport, and body temperature—while an individual is completely at rest, awake, thermoneutral, and in a post-absorptive state following twelve hours of fasting, reflecting baseline cellular energy consumption.

**112.** (B) BMR steadily increases with advancing age after the age of 30.
Basal Metabolic Rate decreases progressively with advancing adult age, dropping roughly one to two percent per decade after age thirty. This decline stems primarily from the gradual loss of lean muscle mass and an increase in adipose tissue ratio. Males maintain higher BMRs than females, while thyroid hormones and fever increase BMR.

**113.** (B) 65 kg and 55 kg
In the 2020 updated dietary guidelines published by the ICMR-NIN expert committee, the reference body weight for an adult Indian male was revised to 65 kilograms, while the reference weight for an adult Indian female was adjusted to 55 kilograms. These values reflect updated anthropometric data across healthy Indian populations.

**114.** (B) Heavy Worker → Moderate Worker → Sedentary Worker
Daily caloric requirements for adults depend directly on physical activity levels and occupational demands. Heavy workers, such as manual laborers or construction workers, require the highest daily caloric intake to sustain physical output. Moderate workers require intermediate energy levels, whereas sedentary workers who perform desk jobs have the lowest daily energy needs.

**115.** (C) Proteins
Specific Dynamic Action, or the thermic effect of food, represents the energy required for digestion, absorption, transport, and metabolic processing of ingested nutrients. Dietary proteins produce the highest thermic effect, consuming roughly 20 to 30 percent of their energy intake, compared to carbohydrates at 5 to 10 percent and fats at 0 to 3 percent.

Downloaded from www.pdf.tube

hospital practice, which principle is strictly followed?
(A) O negative blood is used for all transfusions to avoid any risk.
(B) Type-specific blood transfusion is always preferred.
(C) Relatives' blood is always transfused without matching.
(D) O positive blood is used universally for males only.

**34.** In the context of plasma donation, which blood group is considered the "Universal Plasma Donor"?
(A) Blood Group O
(B) Blood Group A
(C) Blood Group B
(D) Group AB

**35.** Consider the following statements regarding universal donors and recipients:
I. O negative blood lacks A, B, and Rh(D) antigens.
II. AB positive individuals can safely donate red blood cells to any other blood type.
III. O positive is the most common blood type in the Indian population.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**36.** The primary purpose of conducting a "cross-match" before a blood transfusion is to:
(A) Accurately measure the baseline hemoglobin concentration of the donor
(B) Determine the current systemic arterial blood pressure of the recipient
(C) Detect recipient antibodies against donor red blood cells
(D) Screen for potential blood-borne infectious diseases in the donated sample

**37.** In laboratory blood grouping, if a sample of blood shows agglutination with both Anti-A and Anti-B sera, but no agglutination with Anti-D serum, the blood group is:
(A) AB negative
(B) O positive blood
(C) A positive blood
(D) B negative blood

**38.** A major hemolytic transfusion reaction is most commonly caused by:
(A) Transfusing Rh-positive blood to an Rh-positive recipient
(B) Transfusing blood stored for less than 5 days
(C) Minor allergic reactions to donor plasma proteins
(D) Transfusing ABO-incompatible red blood cells

**39.** Which of the following symptoms is a hallmark of an acute hemolytic transfusion reaction?
(A) Gradual and progressive loss of body scalp hair
(B) Fever, rigors, shivering, and dark hemoglobinuric urine
(C) Marked increase in appetite accompanied by intense thirst
(D) Transient or temporary color blindness in both eyes

**40.** Consider the following statements about blood transfusion protocols:
I. Patient identification must be strictly verified before starting a transfusion.
II. Blood components should be warmed to 45°C before transfusion.
III. Transfusions should typically be completed within 4 hours to prevent bacterial growth.
IV. Vital signs must be monitored closely during the first 15 minutes of a transfusion.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

**41.** The inheritance of the ABO blood group system in humans is a classic example of:
(A) Incomplete dominance and blending gene expression
(B) Polygenic additive inheritance patterns
(C) Sex-linked recessive genetic inheritance
(D) Multiple allelism and codominance

**42.** How many different genotypes are possible for the four phenotypes (A, B, AB, O) in the human ABO blood group system?
(A) Four
(B) Six
(C) Eight
(D) Ten

NODIA

**126.** (B) 75% Rural and 50% Urban
The National Food Security Act of 2013 legally entitles up to 75 percent of the rural population and 50 percent of the urban population to receive subsidized foodgrains through the Targeted Public Distribution System. Overall, the act covers nearly two-thirds of India's population, providing subsidized food access to vulnerable socio-economic groups nationwide.

**127.** (C) 35 kg per household
Under the Antyodaya Anna Yojana component of the National Food Security Act, the poorest households are entitled to receive 35 kilograms of subsidized foodgrains per household per month. Priority Households, in contrast, receive a monthly allocation of 5 kilograms of foodgrains per person, ensuring targeted social safety nets across vulnerable demographics.

**128.** (C) Rs 6,000
Section 4 of the National Food Security Act mandates that every pregnant woman and lactating mother is entitled to a maternity benefit of not less than 6,000 rupees. This financial support helps offset wage loss during pregnancy, supports maternal rest, and improves access to nutritious foods and health services during early child care.

**129.** (A) Rice is provided at Rs 3/kg, Wheat at Rs 2/kg, and Coarse grains at Rs 1/kg.
The National Food Security Act originally established issue prices for Priority Households at 3 rupees per kilogram for rice, 2 rupees per kilogram for wheat, and 1 rupee per kilogram for coarse grains. These subsidized rates were established to help ensure food security for economically vulnerable populations across Indian states.

**130.** (A) Food Security Allowance to the beneficiary
Under the National Food Security Act, if an entitled beneficiary fails to receive their designated allocation of foodgrains or meals due to supply disruptions, the state government is legally required to pay a Food Security Allowance. This financial compensation protects consumer entitlements and holds public distribution systems accountable.

**131.** (C) Rs 6,000
The Indira Gandhi Matritva Poshan Yojana, implemented by the Government of Rajasthan, provides a financial incentive of 6,000 rupees to pregnant women upon the birth of their second child. Disbursed across multiple installments upon achieving health milestones, this grant encourages proper maternal nutrition, institutional health care, and child immunization.

**132.** (D) Reconstituted milk
Under the Mukhyamantri Bal Gopal Yojana in Rajasthan, school children in classes 1 through 8 attending government and aided schools receive reconstituted milk on specified school days. Prepared from skimmed milk powder, this supplement delivers dietary protein and calcium, helping improve daily nutritional intake and encouraging consistent school attendance among children.

**133.** (C) It targets low birth weight and wasting via cash transfers and nutrition behavior communication.
The RajPusht project in Rajasthan focuses on reducing child wasting and low birth weight across targeted tribal and vulnerable districts. By combining cash transfers with Social and Behavior Change Communication, the initiative supports pregnant and lactating women, promoting improved maternal dietary practices, early infant feeding, and healthcare utilization during critical developmental stages.

**134.** (B) Stunting among children under 5 in Rajasthan has been completely eradicated.
According to NFHS-5 survey data for Rajasthan, childhood undernutrition remains a public health concern, with stunting affecting a significant proportion of children under five years old. Anemia rates among women and young children remain high, and wasting continues to affect child development across the state, confirming that stunting has not been eradicated.

**135.** (D) Iron, Folic Acid, and Vitamin $B_{12}$
Fortified wheat flour supplied through the Public Distribution System in Rajasthan is fortified with iron, folic acid, and Vitamin $B_{12}$. Adding these key micronutrients to staple wheat flour helps combat widespread nutritional anemia and supports neural health, providing a cost-effective way to improve micronutrient intake across large populations.

Click Here to Buy book on Flipkart

**136.** (A) Empower women SHGs by providing a product market, boosting household nutrition.
The Department of Women and Child Development in Rajasthan organizes Amrita Haat trade fairs to support self-help group members and female entrepreneurs. These fairs offer a venue for women to market handcrafts, processed foods, and regional goods, helping boost household incomes, support women's economic independence, and improve family access to nutritious foods.

**137.** (C) Boiling in excess water that is then discarded
Water-soluble vitamins, including Vitamin C and the B-complex group, leach easily into cooking water during high-temperature preparation. When vegetables are boiled in excess water that is subsequently discarded, significant amounts of these heat-sensitive vitamins are lost. Methods like steaming, microwaving, or rapid stir-frying help retain a higher proportion of water-soluble nutrients.

**138.** (A) Drives B-vitamins from bran into the endosperm, preserving them during milling.
Parboiling rice involves soaking, steaming, and drying raw paddy prior to milling. Heat and pressure drive water-soluble nutrients—particularly B-vitamins like thiamine—from the outer bran layer into the central starchy endosperm. Consequently, parboiled rice retains a higher micronutrient content after milling compared to polished raw white rice.

**139.** (D) Washing prior to cutting and cooking covered with minimal water
To maximize nutrient retention, fresh produce should be washed thoroughly before cutting to avoid leaching water-soluble vitamins from exposed surfaces. Cooking vegetables covered in minimal water reduces thermal exposure and limits nutrient destruction. In contrast, chopping foods hours in advance or boiling uncovered in excess water increases vitamin oxidation and loss.

**140.** (B) Amino acids and reducing sugars
The Maillard reaction is a non-enzymatic browning process occurring at elevated cooking temperatures between the amino groups of proteins or amino acids and the carbonyl groups of reducing sugars. While this reaction develops desirable aromas, colors, and savory flavors in cooked foods, it can reduce the biological availability of essential amino acids like lysine.

www.nodia.in

NODIA

# CHAPTER 07
# Blood Groups and Rh Factor

**1.** Which of the following components of human blood is primarily responsible for the transport of oxygen to the peripheral tissues?
(A) Leukocytes
(B) Erythrocytes
(C) Thrombocytes
(D) Blood plasma

**2.** What is the approximate percentage of plasma in the total volume of normal human blood?
(A) 35 percent
(B) 45 percent
(C) 55 percent
(D) 70 percent

**3.** Blood serum differs from blood plasma in which of the following ways?
(A) Serum lacks fibrinogen and other clotting factors
(B) Serum lacks antibodies
(C) Serum contains a higher concentration of red blood cells
(D) Serum lacks water content entirely

**4.** Among the various types of white blood cells (leukocytes), which one is the most abundant in a healthy human body?
(A) Lymphocytes
(B) Eosinophils
(C) Neutrophils
(D) Monocytes

**5.** The biconcave shape of human red blood cells is physiologically advantageous because it:
(A) Maximizes surface area-to-volume ratio for rapid gas exchange
(B) Allows mature circulating red blood cells to undergo mitosis
(C) Prevents recognition and destruction by macrophages in spleen
(D) Increases internal cell volume to store essential nutrients

**6.** Which of the following proteins is the most abundant in human blood plasma and plays a crucial role in maintaining oncotic pressure?
(A) Globulin
(B) Fibrinogen
(C) Prothrombin
(D) Albumin

**7.** The ABO blood group system was discovered in the year 1900 by which of the following scientists?
(A) William Harvey
(B) Karl Landsteiner
(C) Alexander Wiener
(D) Gregor Mendel

NODIA

**8.** For his pioneering work in discovering the main blood groups, Karl Landsteiner was awarded the Nobel Prize in Physiology or Medicine in which year?
(A) 1910
(B) 1925
(C) 1930
(D) 1945

**9.** While Karl Landsteiner discovered the A, B, and O blood groups, the fourth group, AB, was discovered a couple of years later by:
(A) Watson and Crick
(B) Levine and Stetson
(C) Bhende and Bhatia
(D) Decastrello and Sturli

**10.** Consider the following statements regarding the discovery of blood groups:
I. Karl Landsteiner identified the ABO blood group system.
II. The Rh factor was discovered by Karl Landsteiner and Alexander Wiener.
III. The Bombay blood group was discovered by European scientists in 1952.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**11.** Which animal species was instrumental in the experiments conducted by Landsteiner and Wiener leading to the discovery of the Rh factor?
(A) Chimpanzee
(B) Rhesus macaque

(C) Guinea pig
(D) Sprague Dawley rat

**12.** A person with blood group A has which of the following antigens on the surface of their red blood cells?
(A) B antigen
(B) A antigen
(C) Both A and B antigens
(D) Neither A nor B antigen

**13.** Which blood group is characterized by the presence of both anti-A and anti-B antibodies in the blood plasma?
(A) Group O
(B) Group A
(C) Group B
(D) Group AB

**14.** What is the fundamental basis for the classification of blood into A, B, AB, and O groups?
(A) Variations in the average physical size of red blood cells
(B) Differences in overall concentration of hemoglobin in blood
(C) Presence of specific surface antigens on RBC membranes
(D) Quantity of free iron dissolved directly in blood plasma

**15.** Consider the following statements about the ABO blood group system:
I. Blood group O has no antigens on the RBC surface.
II. Blood group AB lacks antibodies against A and B antigens in the plasma.
III. Blood group A has anti-B antibodies in the plasma.
IV. Blood group B has B antigens on the RBC surface.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

**16.** In standard medical practice, what does the letter 'O' in the ABO blood group system originally signify?
(A) Optimal
(B) Ortho
(C) Ohne
(D) Organ

**17.** A person whose blood group is AB can typically receive blood from which of the following blood groups?
(A) Only AB
(B) Only O
(C) A and B only
(D) A, B, AB, and O

**18.** Antigens that determine the ABO blood groups are chemically classified as:
(A) Complex pure lipid molecules
(B) Short-chain nucleic acid strands
(C) Unbranched simple sugar chains
(D) Glycolipids and glycoproteins

**19.** When a foreign blood group antigen enters a human body, the immune system primarily responds by producing which of the following?
(A) Antibodies
(B) Antibiotics
(C) Antigens
(D) Antihistamines

**20.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** A person with blood group O is known as a universal donor.
**Reason (R):** The red blood cells of a person with blood group O lack A and B antigens, thus preventing agglutination by the recipient's antibodies.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**21.** Which specific immunoglobulin class do naturally occurring anti-A and anti-B antibodies typically belong to?
(A) IgM
(B) IgE
(C) IgA
(D) IgD

**22.** In the context of immunology, an antibody functions by binding to its specific antigen to form what is known as a:
(A) Primary blood coagulation cascade
(B) Functional hemoglobin macromolecule
(C) Membrane-bound intracellular phagosome
(D) Standard antigen-antibody complex

Downloaded from www.pdf.tube

**23.** Agglutination in blood typing occurs due to the interaction between:
(A) Circulating plasma proteins and white blood cells
(B) RBC antigens and specific antibodies
(C) Activated blood platelets and soluble fibrinogen
(D) Intracellular hemoglobin molecules and dissolved oxygen

**24.** What does a "positive" blood type (e.g., $A^+$) indicate regarding the Rh factor?
(A) Presence of circulating anti-Rh antibodies in plasma
(B) An unusually high concentration of red blood cells
(C) Presence of Rh D antigen on red blood cells
(D) Acquired active immunity against systemic Rh disease

**25.** Match the blood groups in List I with their characteristic features in List II.
**List I**
P. A positive
Q. O negative
R. AB positive
S. B negative
**List II**
1. Has B antigen but lacks D antigen
2. Universal recipient
3. Has A and D antigens
4. Universal donor
(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-4, R-1, S-2
(D) P-1, Q-2, R-3, S-4

**26.** Which of the following statements about the Rh factor is correct?
(A) Rh antibodies form in Rh-negative individuals only after exposure to Rh-positive blood.
(B) Rh antibodies are naturally present in the plasma of all Rh-negative individuals continuously from birth.
(C) The Rh factor phenotype is determined primarily by external environmental conditions after birth.
(D) Rh-positive individuals naturally produce circulating anti-Rh antibodies in their bloodstream.

**27.** The most highly immunogenic and clinically significant antigen in the Rh system is:
(A) Antigen C
(B) Antigen D
(C) Antigen c
(D) Antigen E

**28.** What is the approximate percentage of the Rh-positive population globally, indicating its dominance over the Rh-negative trait?
(A) 40-45 percent
(B) 60-65 percent
(C) 80-85 percent
(D) 95-99 percent

**29.** If an Rh-negative patient mistakenly receives an emergency transfusion of Rh-positive blood for the very first time, what is the most likely immediate outcome?
(A) Immune sensitization resulting in production of anti-D antibodies
(B) An immediate, severe, and widespread fatal systemic hemolytic transfusion reaction
(C) Spontaneous conversion of the patient's biological blood group to Rh-positive
(D) Immediate and complete destruction of all of the patient's own white blood cells

**30.** Identify the correct sequence of blood type compatibility from safest to least safe when transfusing an AB positive recipient in an emergency:
(A) AB positive → A positive → O negative
(B) O negative → AB positive → B positive
(C) AB positive → O positive → B negative
(D) The recipient can safely receive any of these types equally

**31.** The term "Universal Donor" is most accurately applied to which specific blood type?
(A) O positive
(B) AB positive
(C) AB negative
(D) O negative

**32.** Why is an individual with blood type AB positive considered the "Universal Recipient"?
(A) They have both A and B antibodies in their plasma.
(B) They lack A, B, and Rh antigens on their red blood cells.
(C) They lack anti-A, anti-B, and anti-Rh antibodies in their plasma.
(D) They possess exceptionally strong immune systems that destroy foreign blood cells.

**33.** While O negative whole blood can technically be given to any patient, in standard non-emergency

NODIA

**116.** (D) High Fat, Salt, and Sugar
The acronym HFSS stands for High Fat, Salt, and Sugar, used in nutritional policy to classify processed junk foods and beverages. Diets rich in HFSS products provide high energy density alongside low micronutrient content, contributing to chronic conditions like obesity, hypertension, type 2 diabetes, and cardiovascular diseases across populations.

**117.** (C) 2%
To reduce dietary trans fat consumption, the Food Safety and Standards Authority of India capped industrial trans fatty acids in fats and oils at two percent by weight starting in January 2022. This regulation aims to limit commercial trans fat content in processed foods, supporting public efforts against cardiovascular diseases.

**118.** (B) It promotes insulin resistance via recurrent blood glucose spikes.
Regular consumption of junk foods rich in simple sugars and saturated fats leads to rapid postprandial blood glucose spikes and elevated insulin secretion. Over time, frequent insulin surges can cause cellular insulin resistance, increasing the risk of developing metabolic syndrome and type 2 diabetes while disrupting normal lipid metabolism and cardiovascular health.

**119.** (D) Ultra-processed foods
The NOVA system categorizes foods into four groups based on the extent of industrial processing. Soft drinks, instant noodles, packaged snacks, and reconstituted meat products fall under group four as ultra-processed foods. These items typically contain industrial formulations, additives, flavorings, and emulsifiers, providing low micronutrient density despite high caloric content.

**120.** (A) An imbalance in the beneficial microbial community of the human gut.
Dysbiosis refers to an imbalance or alteration in the composition and metabolic activity of the gut microbial community. Diets high in ultra-processed sugars, refined starches, and saturated fats can disrupt beneficial intestinal bacteria, reducing microbial diversity and contributing to chronic gastrointestinal inflammation, altered intestinal barrier integrity, and metabolic dysfunction.

**121.** (C) They neutralize free radicals by donating an electron, preventing cellular damage.
Antioxidants function primarily by donating an electron to unstable free radicals and reactive oxygen species without becoming reactive themselves. This electron donation neutralizes oxidants, terminating damaging chain reactions that break down cellular lipids, proteins, and nuclear DNA, thereby protecting cellular structures against oxidative stress and metabolic damage.

**122.** (C) Statement I is correct but Statement II is incorrect
Vitamin C, Vitamin E, and beta-carotene serve as critical exogenous antioxidants supplied through dietary foods like fruits and vegetables. However, the human body also produces endogenous antioxidant enzymes, such as superoxide dismutase, catalase, and glutathione peroxidase, which work alongside dietary antioxidants to neutralize cellular reactive oxygen species.

**123.** (D) Consuming deeply fried, oxidized cooking oil effectively cures oxidative stress.
Oxidative stress develops when reactive oxygen species generation exceeds the capacity of endogenous and exogenous antioxidant defenses. Chronic oxidative stress contributes to cell damage involved in atherosclerosis and cancer development. Consuming deeply fried or oxidized cooking oils introduces lipid peroxides that increase systemic oxidative stress rather than alleviating it.

**124.** (B) Lycopene - Tomatoes
Lycopene is a carotenoid antioxidant abundant in red fruits and vegetables, particularly ripe tomatoes and tomato-based products. Consuming lycopene helps neutralize free radicals and protects lipids and membranes from oxidative damage. The other pairings listed combine antioxidants with foods that are not their primary natural sources.

**125.** (C) White rice
Fresh blueberries, green tea, and raw spinach contain high levels of dietary antioxidants, such as anthocyanins, polyphenols, and carotenoids. Refined white rice undergoes milling that removes its outer bran layer and germ, leaving an endosperm composed primarily of starch with minimal natural antioxidant compounds compared to whole plant foods.

Click Here to Buy book on Amazon

**43.** If a mother has blood group O (genotype ii) and the father has blood group AB (genotype IAIB), what are the possible blood groups of their children?
(A) Only O and AB
(B) Only A and B
(C) A, B, AB, and O
(D) Only AB

**44.** A child has blood group O. Which of the following parental combinations of blood groups is biologically impossible?
(A) Both parents are group O
(B) One parent is group AB and the other group O
(C) One parent is phenotype A and the other is phenotype B
(D) Both parents are group A

**45.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The AB blood type exhibits co-dominance.
**Reason (R):** In a heterozygous individual carrying both IA and IB alleles, both alleles express their specific antigens fully on the RBC surface.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**46.** The gene responsible for determining the ABO blood group in humans is located on which chromosome?
(A) Chromosome 9
(B) Chromosome 11
(C) Chromosome 21
(D) X Chromosome

**47.** Erythroblastosis fetalis is a hemolytic disease of the newborn primarily caused by incompatibility involving which blood system?
(A) ABO system
(B) Kell system
(C) Duffy system
(D) Rh system

**48.** Under what specific parental conditions does the risk of Erythroblastosis fetalis arise in a pregnancy?
(A) An Rh-positive mother and an Rh-negative father
(B) When both biological parents are Rh-negative
(C) Rh-negative mother and Rh-positive father
(D) When both biological parents are Rh-positive

**49.** Why is the first Rh-positive child born to an Rh-negative mother usually unaffected by Erythroblastosis fetalis?
(A) The maternal immune system becomes completely suppressed during an initial pregnancy.
(B) Sensitization occurs during delivery, so anti-Rh antibodies form after birth.
(C) Fetal erythrocytes are physically incapable of crossing the placental barrier during pregnancy.
(D) The surface Rh antigen is not functionally expressed until the child reaches two years of age.

**50.** Match the medical interventions or terms in List I with their descriptions related to Rh incompatibility in List II.
**List I**
P. Anti-D immunoglobulin (RhoGAM)
Q. Erythroblastosis fetalis
R. Intrauterine transfusion
S. Jaundice
**List II**
1. Severe anemia and destruction of fetal RBCs
2. Treatment given to a severely anemic fetus before birth
3. Preventive injection given to Rh-negative mothers
4. Symptom caused by accumulation of bilirubin from broken RBCs
(A) P-3, Q-1, R-2, S-4
(B) P-1, Q-2, R-4, S-3
(C) P-4, Q-1, R-3, S-2
(D) P-3, Q-4, R-1, S-2

**51.** The primary purpose of administering Anti-D immunoglobulin to an unsensitized Rh-negative mother is to:
(A) Clear fetal Rh-positive RBCs before maternal sensitization occurs
(B) Effectively treat and resolve severe neonatal jaundice in the newborn infant
(C) Temporarily convert the biological blood phenotype of the mother to Rh-positive
(D) Stimulate uterine contractions to induce maternal labor rapidly

NODIA

**52.** Which of the following is NOT a typical clinical manifestation of severe Erythroblastosis fetalis in a newborn?
(A) Severe systemic fetal edema (Hydrops fetalis)
(B) Bilirubin-induced brain damage (Kernicterus)
(C) Hyperglycemia
(D) Profound destruction of red blood cells (Severe anemia)

**53.** According to standard guidelines of the National Blood Transfusion Council (NBTC), what is the standard eligible age range for voluntary blood donation?
(A) 16 to 60 years
(B) 18 to 65 years
(C) 21 to 55 years
(D) 18 to 50 years

**54.** What is the minimum acceptable body weight for a healthy individual to be eligible to donate 350 ml of blood in standard medical practice?
(A) 40 kg
(B) 45 kg
(C) 55 kg
(D) 60 kg

**55.** Arrange the following steps of the blood donation procedure in the correct chronological order:
I. Post-donation rest and refreshment
II. Medical screening and counseling (checking hemoglobin, BP)
III. Phlebotomy (actual blood collection)
IV. Donor registration
(A) IV, II, III, I
(B) IV, III, II, I
(C) II, IV, III, I
(D) II, III, IV, I

**56.** According to standard medical guidelines, what is the mandatory minimum interval between two whole blood donations for a healthy male donor?
(A) 1 month
(B) 3 months
(C) 6 months
(D) 12 months

**57.** Which of the following conditions constitutes a permanent deferral (lifetime ban) from donating blood?
(A) Having a common cold
(B) Having undergone a minor dental extraction
(C) Having received a typhoid vaccination
(D) Testing positive for HIV or Hepatitis B

**58.** The minimum hemoglobin level required for a male or female donor to be accepted for blood donation is:
(A) 10.5 g/dL
(B) 11.0 g/dL
(C) 12.5 g/dL
(D) 14.0 g/dL

**59.** In a standard blood bank, collected whole blood is normally stored at what temperature range to maintain its viability?
(A) -20°C to -10°C
(B) 2°C to 6°C
(C) 15°C to 20°C
(D) 35°C to 37°C

**60.** Consider the following statements about blood bank functioning:
I. Blood banks routinely screen donated blood for Hepatitis B, Hepatitis C, HIV, Syphilis, and Malaria.
II. Platelets extracted from donated blood can be stored for up to one year.
III. CPDA-1 is a commonly used anticoagulant and preservative in blood bags.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**61.** What is the maximum shelf-life of red blood cells (RBCs) when stored in CPDA-1 (Citrate Phosphate Dextrose Adenine) preservative solution at 2-6°C?
(A) 7 days
(B) 14 days
(C) 35 days
(D) 120 days

**62.** In the context of blood component separation at blood banks, which machine is utilized to separate whole blood into its components like plasma, RBCs, and platelets?
(A) Automated UV-Vis spectrophotometer
(B) High-pressure steam autoclave
(C) Refrigerated centrifuge
(D) Automated hemodialysis machine

**63.** Platelets stored in blood banks require continuous gentle agitation and are kept at which temperature?
(A) 2°C to 6°C (chilled)

Downloaded from www.pdf.tube

(B) 20°C to 24°C
(C) 37°C (body temperature)
(D) -80°C (deep freeze)

**64.** Fresh Frozen Plasma (FFP) is primarily used in clinical settings to treat patients with:
(A) Severe chronic anemia with low hemoglobin
(B) Abnormally low circulating white blood cell counts
(C) Coagulation factor deficiencies
(D) Severe acute intravascular fluid dehydration

**65.** Consider the following statements regarding the blood clotting mechanism:
I. Prothrombin is converted to thrombin by thrombokinase (prothrombinase).
II. Thrombin converts soluble fibrinogen into insoluble fibrin.
III. Fibrin threads entangle blood cells to form a clot.
IV. Vitamin C is the most essential vitamin required for the synthesis of clotting factors.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

**66.** Which mineral ion is absolutely essential for multiple steps in the blood coagulation cascade?
(A) Iron ($Fe_2^+$)
(B) Potassium ($K^+$)
(C) Magnesium ($Mg^{2+}$)
(D) Calcium ($Ca_2^+$)

**67.** The intrinsic and extrinsic pathways of blood coagulation converge at a common pathway which begins with the activation of which factor?
(A) Factor X (Stuart-Prower factor)
(B) Factor VIII (Antihemophilic factor)
(C) Factor XII (Hageman factor)
(D) Factor I (Fibrinogen)

**68.** Which fat-soluble vitamin is vital for the hepatic synthesis of prothrombin and several other clotting factors (Factors VII, IX, and X)?
(A) Vitamin A
(B) Vitamin D
(C) Vitamin K
(D) Vitamin E

**69.** A condition in which a blood clot forms abnormally within an intact blood vessel and remains attached to the vessel wall is known as a:
(A) Thrombus
(B) Embolus
(C) Aneurysm
(D) Hemorrhage

**70.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Heparin is often administered to patients undergoing prolonged surgeries.
**Reason (R):** Heparin acts as a powerful anticoagulant that prevents unwanted blood clotting within the blood vessels.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**71.** The most common cause of anemia worldwide, prevalent particularly among women and children, is the deficiency of:
(A) Vitamin $B_{12}$
(B) Iron
(C) Folic Acid
(D) Protein

NODIA

**72.** Pernicious anemia is a specific type of megaloblastic anemia caused primarily by the body's inability to absorb which of the following vitamins?
(A) Vitamin $B_1$ (Thiamine)
(B) Vitamin $B_6$ (Pyridoxine)
(C) Vitamin $B_{12}$
(D) Vitamin C (Ascorbic acid)

**73.** Hemophilia A, a well-known genetic bleeding disorder, is caused by the deficiency of which specific blood clotting factor?
(A) Factor VII (Proconvertin)
(B) Factor IX (Christmas factor)
(C) Factor XI (Plasma thromboplastin antecedent)
(D) Factor VIII

**74.** Which of the following is a characteristic feature of Aplastic Anemia?
(A) Bone marrow failure causing pancytopenia
(B) Excessive premature destruction of red blood cells within the spleen
(C) Genetic production of abnormally shaped, sickle-like red blood cells
(D) Excessive pathological iron accumulation in

**9.** (D) Decastrello and Sturli
Following Karl Landsteiner's initial discovery of blood groups A, B, and O in 1900, his students Alfred von Decastrello and Adriano Sturli identified the fourth major phenotype, AB, in 1902. They observed blood samples that contained both major red blood cell antigens on their membranes while lacking corresponding plasma antibodies against either A or B antigens.

**10.** (A) I and II only
Karl Landsteiner established the ABO blood system in 1900, and later collaborated with Alexander Wiener in 1940 to discover the Rh blood group system. However, the rare Bombay blood group phenotype was discovered in 1952 by Indian physician Dr. Y. M. Bhende and colleagues in Bombay, rather than by European scientists.

**11.** (B) Rhesus macaque
The Rh blood group system derived its name from experiments involving the Rhesus macaque monkey species. In 1940, Karl Landsteiner and Alexander Wiener immunized rabbits and guinea pigs with red blood cells from Rhesus monkeys. The resulting antibodies agglutinated human red blood cells in roughly eighty-five percent of tested individuals, demonstrating the presence of the shared Rh factor.

**12.** (B) A antigen
Human blood group classification is determined by specific carbohydrate structures attached to cell surface lipids and proteins on red blood cell membranes. Individuals belonging to blood group A carry specific A antigens on the outer surface of their erythrocytes, while naturally producing anti-B antibodies circulating within their blood plasma to protect against foreign biological blood types.

**13.** (A) Group O
Individuals with blood group O lack both A and B carbohydrate antigens on the outer surface membrane of their red blood cells. Because their immune system does not recognize these surface structures as self, their blood plasma naturally produces and contains both anti-A and anti-B antibodies, which will agglutinate red cells carrying either A or B surface antigens.

**14.** (C) Presence of specific surface antigens on RBC membranes
The classification of human blood into major ABO groups depends on specific carbohydrate antigens bound to glycolipids and glycoproteins on red blood cell membranes. Inherited enzymatic activity determines whether A antigens, B antigens, both antigens, or neither antigen are expressed on erythrocyte surfaces, dictating individual blood types and corresponding plasma antibody patterns essential for transfusion compatibility.

**15.** (D) I, II, III and IV
The ABO system is defined by surface antigens and plasma antibodies. Group O erythrocytes lack A and B antigens. Group AB plasma lacks anti-A and anti-B antibodies. Group A possesses surface A antigens with circulating anti-B antibodies. Group B possesses surface B antigens with circulating anti-A antibodies. All four physiological statements accurately characterize these fundamental immunological relationships.

**16.** (C) Ohne
In Karl Landsteiner's original blood group classification published in German, the letter designation referred to the German word "ohne", which translates to "without". This designation emphasized that red blood cells in this specific group existed without A or B surface antigens, which was later adopted globally as the letter O in standard medical nomenclature.

**17.** (D) A, B, AB, and O
Individuals with blood group AB possess both A and B surface antigens on their red blood cells and therefore do not produce anti-A or anti-B antibodies in their plasma. Lacking these circulating agglutinins, an AB recipient can safely accept red blood cell transfusions from A, B, AB, or O donor blood groups without triggering immediate antibody-mediated destruction.

**18.** (D) Glycolipids and glycoproteins
ABO blood group antigens are complex oligosaccharide chains attached to lipid cores and protein backbones embedded within red blood cell membranes. These surface molecules form glycolipids and glycoproteins whose terminal sugar residues determine immunological specificity, with N-acetylgalactosamine specifying the A antigen and D-galactose specifying the B antigen on the underlying H antigen structure.

Click Here to Buy book on Flipkart

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

**83.** Convalescent plasma therapy relies on the principle of transferring which specific component from a recovered patient to an infected patient?
(A) Neutralizing antibodies
(B) Active functional white blood cells
(C) Viral surface glycoprotein antigens
(D) Broad-spectrum chemical antibiotics

**84.** Which of the following is NOT a primary therapeutic use of donated blood plasma?
(A) Treating severe burn victims to replace lost fluids and proteins
(B) Manufacturing clotting factor concentrates for hemophilia patients
(C) Providing immediate oxygen-carrying capacity in severe acute anemia
(D) Treating patients with severe liver disease who have clotting factor deficiencies

**85.** Consider the following statements about plasma donation:
I. A person can donate plasma much more frequently than whole blood.
II. Plasma consists of approximately 90% water.
III. AB positive individuals are considered universal red cell donors but cannot donate plasma.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**86.** How long does the human body typically take to replace the plasma volume lost during a single plasmapheresis donation?
(A) 24 to 48 hours
(B) 1 to 2 full weeks
(C) 1 complete month
(D) 3 consecutive months

**87.** Human normal immunoglobulin, used to treat immunodeficiency disorders and some autoimmune diseases, is therapeutically extracted from which component of donated blood?
(A) Red blood cells
(B) Plasma
(C) Platelets
(D) Neutrophils

**88.** In the basic laboratory method for ABO blood typing (forward grouping), patient red blood cells are mixed with known:
(A) Freshly isolated patient serum samples
(B) Isotonic physiological saline water
(C) Known commercial antisera
(D) Known donor commercial red blood cells

**89.** Reverse blood typing (or serum testing) is performed to confirm the results of forward typing. In reverse typing, the laboratory tests the patient's:
(A) Suspended red blood cells tested against known commercial antisera
(B) Isolated platelets tested against specific plasma clotting factors
(C) Unfractionated whole blood tested against pure Rh antigen reagents
(D) Serum against standard A and B red cells

**90.** Consider the following statements regarding blood group testing methods:
I. Agglutination is visually observed as clumping of red blood cells.
II. In the tube method, centrifugation is used to enhance the agglutination reaction.
III. The gel card method is a modern technique providing more sensitive and stable results than the slide method.
IV. If a blood sample agglutinates with anti-A serum but not with anti-B serum, the group is B.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**91.** The primary chemical phenomenon that a technician observes to determine a positive result during manual slide method blood grouping is:
(A) Enzymatic coagulation
(B) Agglutination
(C) Chemical precipitation
(D) Intravascular hemolysis

**92.** When determining the Rh status in a laboratory, the presence of the D antigen is tested using:
(A) Anti-A serum
(B) Anti-D serum
(C) Anti-B serum
(D) Anti-H lectin

**93.** What is the role of the 'Control' well or slide in laboratory blood typing?
(A) To verify reagent validity and rule out auto-agglutination
(B) To properly dilute the concentrated cellular

Downloaded from www.pdf.tube

the hepatic tissue

**75.** Match the blood disorders in List I with their primary defect or cause in List II.

**List I**

P. Polycythemia vera
Q. Leukopenia
R. Thrombocytopenia
S. Leukemia

**List II**

1. Abnormally low platelet count
2. Uncontrolled proliferation of abnormal white blood cells
3. Abnormally high production of red blood cells
4. Decrease in the number of circulating white blood cells

(A) P-3, Q-4, R-1, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-1, S-3

**76.** A patient presents with frequent infections, spontaneous bruising, and extreme fatigue. A blood test reveals low counts of RBCs, WBCs, and platelets. This condition is broadly termed as:
(A) Hemolysis
(B) Pancytopenia
(C) Neutrophilia
(D) Erythrocytosis

**77.** Which of the following is a medically confirmed fact rather than a myth regarding voluntary blood donation?
(A) Lost fluid volume is replaced within 24 to 48 hours.
(B) Blood donation causes a permanent reduction in total systemic blood volume.
(C) Vegetarian individuals do not possess sufficient blood volume to donate safely.
(D) Donating blood on a regular basis frequently causes systemic obesity.

**78.** A common myth is that blood donation is physically painful and weakens the immune system. The fact is that:
(A) Donors experience a complete loss of cellular immunity for up to two weeks.
(B) Regular blood donation directly causes severe chronic joint pain and stiffness.
(C) Needle pain is transient and immunity is unaffected.
(D) Only individuals who perform heavy daily physical labor can donate safely.

**79.** People sometimes avoid blood donation fearing they might contract infectious diseases like HIV. What is the correct factual position in modern medical settings?
(A) There is a 50% probability of contracting a viral infection during blood donation.
(B) Transmission risks exist exclusively if the donor is suffering from an active illness.
(C) Infection risks are significantly elevated during hot summer weather seasons.
(D) Zero risk of HIV transmission due to sterile, single-use equipment.

NODIA

**80.** Select the correct sequence of events that biologically occurs in a donor's body after donating one unit of blood:
(A) Bone marrow is stimulated → Fluid volume recovers within 24-48 hours → RBC count is completely restored within 4-6 weeks
(B) Fluid volume recovers within 24-48 hours → Bone marrow is stimulated → RBC count is completely restored within 4-6 weeks
(C) RBC count is restored in 24 hours → Fluid volume recovers in 4 weeks → Bone marrow is suppressed
(D) Bone marrow is suppressed → Fluid volume expands → RBC count stays permanently lower

**81.** Which of the following statements correctly addresses a common myth concerning women and blood donation?
(A) Women are universally and permanently barred from participating in voluntary blood donation.
(B) Women meeting weight and hemoglobin criteria can donate if not pregnant or lactating.
(C) Women must strictly be over thirty years of age to be eligible for safe blood donation.
(D) Women mandatorily require a full six-month physiological recovery period following donation.

**82.** The medical procedure in which a donor's blood is collected, the plasma is separated and retained, and the red blood cells and other components are returned to the donor's body is called:
(A) Hemodialysis procedure
(B) Standard venipuncture
(C) Diagnostic endoscopy
(D) Plasmapheresis

**103.** The primary reason why Bombay blood group individuals cannot receive blood group O is because:
(A) Group O blood expresses significant amounts of surface A and B antigens.
(B) Group O blood contains H antigen, triggering strong anti-H antibodies.
(C) Group O donor blood is universally and inherently Rh positive.
(D) Individuals with Bombay blood group completely lack circulating platelets.

**104.** Which plant lectin is routinely used in blood banks to test for the presence of the H antigen and differentiate the Bombay phenotype from normal group O?
(A) Dolichos biflorus
(B) Arachis hypogaea
(C) Ulex europaeus
(D) Phaseolus vulgaris

**105.** Select the correct sequence of genetic synthesis for blood group antigens:
(A) Precursor substance → H antigen → A/B antigens
(B) Precursor substance → A/B antigens → H antigen
(C) H antigen → Precursor substance → A/B antigens
(D) A/B antigens → H antigen → Precursor substance

**106.** Thalassemia is an inherited blood disorder characterized by:
(A) Abnormal synthesis of globin chains causing RBC destruction
(B) Genetic production of abnormally shaped, rigid sickle-like red blood cells
(C) Complete congenital or acquired absence of circulating blood platelets
(D) Uncontrolled systemic overproduction of abnormal white blood cells

**107.** Patients suffering from Thalassemia Major typically require which of the following lifelong medical interventions for survival?
(A) Daily subcutaneous administration of synthetic insulin injections
(B) Lifelong blood transfusions and iron chelation therapy
(C) Daily prophylactic administration of anti-D immunoglobulins
(D) Regular and long-term renal replacement dialysis therapy

**108.** Sickle Cell Anemia is a genetic disorder caused by a point mutation. This mutation results in the substitution of which amino acid for glutamic acid in the beta-globin chain of hemoglobin?
(A) Leucine
(B) Valine
(C) Glycine
(D) Tyrosine

**109.** In which geographical or demographic populations is the Sickle Cell trait predominantly found in India, conferring a protective advantage against severe malaria?
(A) Central and western Indian tribal populations
(B) Densely populated coastal urban communities
(C) High altitude indigenous Himalayan populations
(D) Isolated island demographic populations of Andaman

**110.** Consider the following statements regarding genetic blood disorders:
I. Thalassemia is a quantitative defect in globin synthesis.
II. Sickle cell anemia is a qualitative defect resulting in abnormal hemoglobin structure.
III. Both Thalassemia and Sickle Cell Anemia are autosomal recessive disorders.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**111.** Epidemiological studies have suggested a correlation between blood group O and a higher susceptibility to which of the following gastrointestinal issues?
(A) Malignant gastric cancer of the stomach
(B) Symptomatic gallstones in the gallbladder
(C) Acute inflammation of the appendix (appendicitis)
(D) Peptic ulcers linked to H. pylori

**112.** Individuals with which blood group have been statistically observed to have a slightly higher risk of developing gastric cancer compared to other blood groups?
(A) Group O
(B) Group B
(C) Group A
(D) Group AB

Click Here to Buy book on Amazon

blood sample
(C) To precisely measure the overall hemoglobin concentration
(D) To accurately count total numbers of red blood cells present

**94.** The World Health Organization (WHO) actively promotes a framework for global blood safety. Which of the following is a primary objective of this WHO strategy?
(A) Encouraging commercial sale of human blood
(B) Replacing human blood with synthetic substitutes by 2030
(C) Achieving 100% voluntary non-remunerated blood donation
(D) Restricting blood transfusions to emergency cases only

**95.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Government of India established the National Blood Transfusion Council (NBTC).
**Reason (R):** The NBTC aims to ensure the provision of safe, adequate, and high-quality blood and blood components across the country.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**96.** "e-RaktKosh" is a centralized blood bank management information system implemented by the Government of India. What is its main public utility?
(A) Serving as an official commercial e-commerce portal to sell blood online
(B) Providing virtual consultations for blood transfusions via telemedicine
(C) Checking real-time blood group availability in nearby blood banks
(D) Registering newborn infants nationwide for mandatory blood type testing

**97.** In India, the regulation and licensing of blood banks to ensure compliance with national safety standards is jointly overseen by the State Blood Transfusion Council (SBTC) and the:
(A) State Pollution Control Board
(B) Central Drugs Standard Control Organization (CDSCO)
(C) Department of Higher Education
(D) State Road Transport Corporation

**98.** Which flagship program of the Government of India heavily integrates safe blood transfusion services as a critical component to reduce maternal mortality during childbirth?
(A) Swachh Bharat Mission
(B) Make in India
(C) Pradhan Mantri Kisan Samman Nidhi
(D) Janani Shishu Suraksha Karyakaram

**99.** The "Bombay Blood Group" is a rare blood phenotype first discovered in Bombay in 1952 by which physician?
(A) Dr. Y. M. Bhende
(B) Dr. Hargobind Khorana
(C) Dr. Venkatraman Ramakrishnan
(D) Dr. Subhash Mukhopadhyay

NODIA

**100.** Match the blood group concepts in List I with their specific antigen characteristics in List II.
**List I**
P. Bombay phenotype (Oh)
Q. Blood group O
R. Blood group AB
S. Rh-null (Golden blood)
**List II**
1. Lacks A, B, and H antigens
2. Lacks all Rh system antigens
3. Has H antigen but lacks A and B antigens
4. Has A, B, and H antigens
(A) P-1, Q-3, R-4, S-2
(B) P-3, Q-1, R-2, S-4
(C) P-2, Q-3, R-1, S-4
(D) P-1, Q-4, R-3, S-2

**101.** A person with the Bombay blood group requires a blood transfusion. Which of the following blood types can they safely receive?
(A) Only another Bombay blood group
(B) Only O negative
(C) Only AB positive
(D) Any blood type

**102.** In routine forward ABO typing, a sample of Bombay blood group will react in a manner indistinguishable from which normal blood group?
(A) Group A
(B) Group B
(C) Group AB
(D) Group O

**123.** The right ventricle of the human heart pumps deoxygenated blood directly into which blood vessel?
(A) Aorta
(B) Pulmonary artery
(C) Pulmonary vein
(D) Superior vena cava

**124.** Exchange of gases, nutrients, and waste products between the blood and the body tissues occurs exclusively across the thin walls of:
(A) Muscular arteries
(B) Capillaries
(C) Systemic veins
(D) Small arterioles

**125.** Match the components of the circulatory system in List I with their primary function in List II.
**List I**
P. Left Atrium
Q. Left Ventricle
R. Pulmonary Veins
S. Coronary Arteries
**List II**
1. Carries oxygenated blood from lungs to the heart
2. Receives oxygenated blood from the pulmonary veins
3. Pumps oxygenated blood to the entire body via the aorta
4. Supplies oxygenated blood to the heart muscle itself
(A) P-2, Q-3, R-1, S-4
(B) P-1, Q-4, R-2, S-3
(C) P-3, Q-2, R-4, S-1
(D) P-2, Q-1, R-3, S-4

**126.** The pacemaker of the human heart, responsible for initiating the rhythmic heartbeat, is the:
(A) Atrioventricular (AV) node
(B) Bundle of His
(C) Sinoatrial (SA) node
(D) Purkinje fibers

**127.** Which of the following accurately describes "pulmonary circulation"?
(A) Systemic blood flow pathway from heart to brain tissues and back
(B) Portal blood flow pathway from digestive system organs to liver
(C) Systemic circulation and drainage of interstitial lymph fluid
(D) Blood pathway from heart to lungs for oxygenation and back

**128.** Research into "artificial blood" primarily aims to replicate which specific function of natural human blood?
(A) Systemic immune defense against invading pathogens
(B) Cascade coagulation and vascular wound healing
(C) Oxygen transport and tissue delivery
(D) Endocrine production and transport of hormones

**129.** Which class of synthetic chemical compounds has been extensively researched as a potential blood substitute because of its high capacity to dissolve oxygen and carbon dioxide?
(A) Synthetic polyurethanes
(B) Perfluorocarbons (PFCs)
(C) Organosilicon silicones
(D) Thermoplastic polycarbonates

**130.** Arrange the historical development of blood replacement therapy in chronological order:
I. Discovery of ABO blood groups ensuring safe human-to-human transfusions
II. Use of animal blood transfusions to humans
III. Modern research into Hemoglobin-Based Oxygen Carriers (HBOCs)
IV. Development of anticoagulant solutions allowing blood storage
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) IV, I, II, III

**131.** One major clinical advantage of using a viable artificial blood substitute (like HBOCs or PFCs) in emergencies, compared to normal donated blood, is that:
(A) It eliminates the need for blood typing and cross-matching, saving time.
(B) It would permanently replace all of the recipient patient's own blood.
(C) It directly enhances and boosts the recipient patient's immune system.
(D) It can be produced locally inside the recipient patient's bone marrow.

**132.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Current artificial blood substitutes do not entirely replace the functions of natural whole blood.
**Reason (R):** Artificial blood products designed

Downloaded from www.pdf.tube

so far only carry oxygen but lack white blood cells, platelets, and plasma proteins necessary for immunity and clotting.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**133.** When organizing a voluntary blood donation camp in India, organizers must ensure the presence of a medical team led by:
(A) A registered Medical Officer
(B) A licensed and registered nurse practitioner
(C) A certified and trained clinical social worker
(D) A designated local administrative government official

**134.** Prominent public health NGOs, such as the Indian Red Cross Society, play a crucial role in blood donation by:
(A) Manufacturing synthetic artificial blood substitutes in rural areas
(B) Strictly regulating pricing of blood units sold to private hospital networks
(C) Mandating and forcing citizens to donate blood during national health emergencies
(D) Motivating voluntary donors and organizing camps under guidelines

**135.** Consider the following statements regarding the public health significance of blood donation camps:
I. They help maintain adequate stock in regional blood banks for emergency trauma care.
II. They provide free health screenings (like hemoglobin check and BP) to donors.
III. They are permitted to collect blood from individuals of any age.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**136.** Safe blood transfusion services are legally categorized in India under which major act, defining blood as a 'drug'?
(A) The Epidemic Diseases Act, 1897
(B) The Clinical Establishments Act, 2010
(C) The Drugs and Cosmetics Act, 1940
(D) The Medical Termination of Pregnancy Act, 1971

**137.** Which of the following is considered the highest ethical standard and social motivation for donating blood?
(A) Monetary compensation
(B) Gaining preferential treatment in hospitals
(C) Receiving extra academic credits in college
(D) Altruism and community solidarity

**138.** Consider the following statements regarding the social and health impact of a robust blood donation ecosystem:
I. It significantly reduces maternal mortality due to postpartum hemorrhage.
II. It is vital for the survival of children suffering from severe malaria-induced anemia.
III. It supports advanced medical procedures like organ transplants and cancer surgeries.
IV. It completely eradicates the transmission of vector-borne diseases.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

NODIA

**139.** Family or "replacement" blood donation, where friends or family donate in place of the blood used by a patient, is generally discouraged by WHO in favor of voluntary donation because:
(A) Biological family members almost universally possess incompatible blood types.
(B) Pressure may cause donors to hide health risks, raising infection rates.
(C) Blood banks impose significantly higher processing charges for family donors.
(D) Family replacement donors routinely donate much smaller volumes of whole blood.

**140.** Arrange the following public health outcomes in the logical sequence resulting from increased voluntary blood donation awareness:
I. Adequate and steady supply of safe blood in local blood banks
II. Increased participation of youth in voluntary donation camps
III. Reduction in preventable deaths due to severe trauma and maternal hemorrhage
IV. Improved overall community health metrics
(A) II, I, III, IV
(B) I, II, IV, III
(C) II, III, I, IV
(D) III, I, II, IV

# ANSWERS

**1.** (B) Erythrocytes
Red blood cells contain large amounts of hemoglobin, a specialized iron-containing protein that reversibly binds oxygen molecules in the pulmonary capillaries. Through systemic circulation, these cellular components transport bound oxygen efficiently from the lungs to capillary beds throughout peripheral tissues, while also assisting in carrying carbon dioxide waste back to the lungs for excretion during respiration.

**2.** (C) 55 percent
Human whole blood consists of cellular elements suspended within a liquid matrix. In healthy adults, liquid plasma constitutes roughly fifty-five percent of total blood volume. The remaining portion comprises cellular components, predominantly red blood cells, along with white blood cells and platelets. Plasma itself consists mostly of water, dissolved electrolytes, proteins, nutrients, metabolic wastes, and hormones.

**3.** (A) Serum lacks fibrinogen and other clotting factors
Blood serum is liquid derived from blood after whole blood is allowed to clot completely. During coagulation, soluble plasma proteins like fibrinogen are consumed to form insoluble fibrin networks that lock blood cells into a clot. Consequently, serum retains electrolytes, antibodies, and dissolved nutrients identical to plasma, but lacks fibrinogen and key active clotting proteins.

**4.** (C) Neutrophils
Neutrophils represent the most abundant population among circulating white blood cells, accounting for approximately fifty to seventy percent of total leukocytes in healthy human blood. As key early responders of the innate immune system, these phagocytic granulocytes rapidly migrate toward sites of acute bacterial infection or tissue inflammation to engulf pathogens and release microbicidal enzymes.

**5.** (A) Maximizes surface area-to-volume ratio for rapid gas exchange
Mature human erythrocytes possess a specialized biconcave disc shape characterized by a thin central region and thicker outer edges. This structural conformation significantly maximizes the surface area-to-volume ratio, facilitating rapid inward and outward diffusion of oxygen and carbon dioxide across the plasma membrane. It also provides structural flexibility necessary to navigate narrow microvascular capillary beds.

**6.** (D) Albumin
Albumin is synthesized continuously by the liver and serves as the single most abundant protein circulating in human blood plasma. Its principal physiological function involves generating intravascular colloid osmotic pressure, which draws fluid back into systemic capillaries and prevents fluid leakage into surrounding tissues. Additionally, albumin functions as a transport carrier for hormones, fatty acids, and drugs.

**7.** (B) Karl Landsteiner
Austrian physician and immunologist Karl Landsteiner discovered human blood groups in 1900 through systemic cross-testing of red cells and serum from his lab colleagues. He identified agglutination patterns that categorized human blood into three distinct groups initially named A, B, and C. His fundamental discovery laid the scientific foundation for modern blood transfusion medicine and safe immunological typing.

**8.** (C) 1930
Karl Landsteiner received the Nobel Prize in Physiology or Medicine in 1930 in recognition of his groundbreaking discovery of major human blood group antigens. His research transformed blood transfusion from a dangerous and frequently fatal experimental procedure into a safe, standardized clinical therapy by demonstrating how serum antibodies cause lethal agglutination when mixed with incompatible donor red cell antigens.

Click Here to Buy book on Flipkart

**113.** Evolutionary biologists note that the O blood group might provide a survival advantage in regions historically burdened by which severe infectious disease, as it causes less severe rosetting of red blood cells?
(A) Pulmonary tuberculosis
(B) Falciparum Malaria
(C) Paralytic poliomyelitis
(D) Seasonal influenza

**114.** During the COVID-19 pandemic, preliminary observational data suggested that individuals with which blood type might have a slightly lower risk of severe infection compared to those with type A?
(A) Type A
(B) Type B
(C) Type AB
(D) Type O

**115.** Consider the following statements about blood groups and diseases:
I. Blood group correlations with diseases imply that having a certain blood type guarantees getting that disease.
II. The Duffy antigen acts as a receptor for Plasmodium vivax, a malaria parasite.
III. Blood type affects susceptibility to certain diseases partly because antigens are present on tissues other than red blood cells.
IV. Von Willebrand factor levels are naturally lower in individuals with blood group O.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**116.** World Blood Donor Day is celebrated globally every year on which date?
(A) 1st October
(B) 14th June
(C) 1st December
(D) 7th April

**117.** The date of World Blood Donor Day (June 14) was chosen to commemorate the birthday of which eminent scientist?
(A) Karl Landsteiner
(B) Louis Pasteur
(C) Robert Koch
(D) Alexander Fleming

NODIA

**118.** In India, National Voluntary Blood Donation Day is distinct from the global observance and is celebrated annually on:
(A) 1st October
(B) 15th August
(C) 26th January
(D) 12th May

**119.** What is the primary focus and theme typically associated with World Blood Donor Day campaigns driven by the WHO?
(A) Encouraging mandatory blood donation as a prerequisite for college admission
(B) Raising awareness for regular, voluntary, unpaid blood donation
(C) Promoting commercial sale and cross-border trade of human blood products
(D) Reducing total numbers of operational blood banks and facilities globally

**120.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Voluntary, unpaid blood donors are the foundation of a safe blood supply.
**Reason (R):** Voluntary donors have the lowest prevalence of bloodborne infections compared to paid or family replacement donors.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**121.** The human circulatory system is classified as a 'closed' system because:
(A) Blood frequently leaves closed vessels to bathe tissues directly
(B) Oxygen is completely unnecessary for systemic blood circulation
(C) The heart chambers are anatomically sealed from pulmonary tissues
(D) Blood flows entirely inside a closed network of blood vessels

**122.** Which structural feature prevents the backflow of blood in human veins, especially in the lower extremities?
(A) Internal valves
(B) Thick muscular walls
(C) High pressure generated by the heart
(D) The presence of a larger lumen

**19.** (A) Antibodies
When foreign cell surface antigens enter the bloodstream during an incompatible blood transfusion, the recipient immune system recognizes these molecules as non-self. B lymphocytes respond by producing targeted immunoglobulin proteins known as antibodies. These circulating antibodies bind specifically to the foreign erythrocyte antigens, triggering immune reactions such as agglutination, complement activation, and cellular destruction.

**20.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Group O red blood cells lack both A and B surface carbohydrate antigens. When transfused into individuals of any ABO type, the recipient's circulating anti-A or anti-B antibodies cannot bind to the donor cells, thereby preventing immune-mediated agglutination and intravascular hemolysis. This key structural characteristic qualifies group O red cells as universal donor units during medical emergencies.

**21.** (A) IgM
Naturally occurring anti-A and anti-B isohemagglutinins belong predominantly to the immunoglobulin M class. These pentameric antibodies are produced early in life in response to environmental exposure to gut flora expressing similar carbohydrate structures. Due to their large pentameric size, IgM antibodies interact strongly with cell surface antigens, inducing direct visible agglutination and fixing complement efficiently.

**22.** (D) Standard antigen-antibody complex
An antibody functions by recognizing and physically binding to a matching epitope on a specific target antigen. This non-covalent association produces an antigen-antibody complex, which neutralizes target molecules and marks foreign cells for destruction. In blood transfusions, such complex formation between recipient antibodies and incompatible donor red cell surface antigens leads directly to cell clumping and hemolysis.

**23.** (B) RBC antigens and specific antibodies
Agglutination occurs when specific circulating antibodies cross-link separate red blood cells by binding to complementary carbohydrate or protein antigens on their cell membranes. This molecular binding causes foreign or incompatible red cells to clump together into visible clusters within blood samples or blood vessels, serving as the basis for laboratory blood typing and adverse transfusion reactions.

**24.** (C) Presence of Rh D antigen on red blood cells
A positive biological blood type designation indicates the presence of the Rh D protein antigen on red blood cell membranes. The Rh system consists of multiple antigens, but the D antigen is the most immunogenic. Individuals expressing the D antigen on their erythrocytes are classified as Rh-positive, whereas those lacking this membrane protein are categorized as Rh-negative.

**25.** (A) P-3, Q-4, R-2, S-1
Blood group classification combines ABO and Rh antigen systems. Blood carrying A and D antigens is designated A positive. Type O negative lacks A, B, and D antigens, functioning as the universal red cell donor. Type AB positive contains A, B, and D antigens without plasma antibodies, acting as the universal recipient. Type B negative has B antigens but lacks D.

**26.** (A) Rh antibodies form in Rh-negative individuals only after exposure to Rh-positive blood.
Unlike ABO antibodies, anti-Rh antibodies are not naturally present at birth in human plasma. An Rh-negative individual only synthesizes anti-D antibodies after immune exposure to Rh-positive red blood cells, which can occur during an incompatible blood transfusion or during pregnancy and delivery when fetal Rh-positive red cells enter the maternal bloodstream, causing immune sensitization.

**27.** (B) Antigen D
The Rh blood group system encompasses over fifty defined protein antigens, but antigen D is the most potent and immunogenic among them. Exposure of an Rh-negative person to even minimal amounts of D-positive red blood cells frequently triggers a robust immune response with anti-D antibody production, making D antigen testing crucial for transfusion and prenatal care.

NODIA

**28.** (C) 80-85 percent
Globally, approximately eighty to eighty-five percent of the human population carries the dominant Rh D antigen on red blood cells,

that binds specifically to alpha-L-fucose on the H antigen structure. In laboratory blood banking, Ulex europaeus lectin is routinely used to differentiate normal group O cells, which strongly agglutinate, from the rare Bombay phenotype, which fails to agglutinate due to missing H antigens.

**105.** (A) Precursor substance → H antigen → A/B antigens
Biochemical synthesis of ABO antigens proceeds sequentially. Membrane glycosyltransferases first attach fucose to oligosaccharide precursor substance to generate the fundamental H antigen structure. Subsequently, specific ABO gene-encoded transferases add N-acetylgalactosamine or galactose sugar units onto the H antigen substrate, converting it into functional A or B blood group surface antigens on erythrocyte membranes.

**106.** (A) Abnormal synthesis of globin chains causing RBC destruction
Thalassemia is a inherited autosomal recessive blood disorder caused by mutations that reduce or eliminate synthesis of alpha or beta globin polypeptide chains. Unbalanced globin chain synthesis leads to precipitation of excess chains inside developing red blood cells, causing membrane damage, premature erythrocyte destruction, ineffective erythropoiesis, severe chronic anemia, and splenomegaly.

**107.** (B) Lifelong blood transfusions and iron chelation therapy
Patients diagnosed with Thalassemia Major suffer from profound chronic anemia due to severe impairment of beta-globin synthesis. Survival mandates lifelong regular packed red blood cell transfusions every few weeks. Because repeated transfusions lead to systemic iron accumulation in cardiac and hepatic tissues, patients simultaneously require continuous iron chelation therapy to prevent fatal organ failure.

**108.** (B) Valine
Sickle Cell Anemia is caused by a point mutation in the HBB gene on chromosome 11, where adenine is substituted by thymine. This single nucleotide change substitutes hydrophobic valine for hydrophilic glutamic acid at the sixth position of the beta-globin polypeptide chain, yielding abnormal hemoglobin S that polymerizes under low oxygen conditions.

**109.** (A) Central and western Indian tribal populations
In India, the Sickle Cell gene mutation is heavily prevalent among indigenous tribal communities residing across central and western states, including Madhya Pradesh, Maharashtra, Odisha, and Gujarat. Heterozygous carrying of the sickle cell trait provides balanced polymorphism by conferring selective evolutionary protection against severe life-threatening falciparum malaria infection in endemic regions.

**110.** (D) I, II and III
Thalassemia represents a quantitative genetic defect where reduced globin protein chain synthesis occurs. Sickle cell anemia represents a qualitative genetic defect producing structurally abnormal hemoglobin S molecules. Both biological conditions follow autosomal recessive inheritance, requiring offspring to inherit mutant alleles from both carrier parents to express full clinical disease manifestations in adult life.

**111.** (D) Peptic ulcers linked to H. pylori
Epidemiological research demonstrates a statistically significant association between blood group O and increased risk of developing peptic ulcer disease. Helicobacter pylori bacteria bind more efficiently to H antigen receptors expressed on gastric epithelial cells in group O individuals, leading to persistent mucosal inflammation, enhanced gastric acid secretion, and higher peptic ulcer incidence.

**112.** (C) Group A
Clinical studies consistently show that individuals with blood group A have a higher statistical susceptibility to developing gastric adenocarcinoma compared to non-A blood groups. This elevated risk is linked to altered cell surface mucin expression, heightened inflammatory responses, and enhanced bacterial adherence of Helicobacter pylori strains to A-antigen structures on gastric mucosa.

**113.** (B) Falciparum Malaria
Evolutionary studies indicate that blood group O confers a significant selective survival advantage against severe Plasmodium falciparum malaria. Erythrocytes of group O individuals undergo reduced rosetting, a process where infected red cells bind uninfected cells to form vascular obstructions, thereby lowering risks of severe cerebral malaria, microvascular blockage, and systemic death.

Downloaded from www.pdf.tube

that the D antigen is absent, establishing the overall blood type as AB negative.

**38.** (D) Transfusing ABO-incompatible red blood cells
Major acute hemolytic transfusion reactions occur when a patient receives ABO-incompatible red blood cells. Pre-existing IgM isohemagglutinins in the recipient's plasma bind immediately to foreign surface antigens on donor erythrocytes. This activates the complement cascade, causing rapid intravascular destruction of donor red cells, widespread systemic inflammatory responses, acute renal failure, shock, and potentially fatal clinical outcomes.

**39.** (B) Fever, rigors, shivering, and dark hemoglobinuric urine
Acute hemolytic transfusion reactions manifest rapidly during or immediately after incompatible blood administration. Symptoms include sudden fever, shivering, severe chills, flank pain, dyspnea, and hypotension. Rapid intravascular lysis of donor red blood cells releases free hemoglobin into plasma, which filtered through kidneys produces dark red or tea-colored urine, signaling acute hemoglobinuria and potential renal damage.

**40.** (B) I, III and IV only
Safe blood administration requires strict patient identification at the bedside, continuous monitoring during the initial fifteen minutes to detect adverse reactions early, and completion within four hours to minimize bacterial contamination risk. Blood components must never be heated to forty-five degrees, as excessive heat denatures plasma proteins and causes severe thermal hemolysis of erythrocytes.

**41.** (D) Multiple allelism and codominance
ABO blood group inheritance is governed by a single gene located on chromosome 9 that exhibits both multiple allelism and codominance. The gene possesses three primary alleles: IA, IB, and i. Alleles IA and IB are both dominant over the recessive i allele, but when inherited together, IA and IB are co-dominant, fully expressing both A and B antigens simultaneously.

**42.** (B) Six
The three alleles governing the ABO system generate six distinct diploid genotypes. Homozygous IAIA and heterozygous IAi genotypes produce phenotype A. Homozygous IBIB and heterozygous IBi genotypes produce phenotype B. Heterozygous IAIB yields phenotype AB through co-dominance, while homozygous ii yields phenotype O. Thus, three alleles combine to form six possible genetic combinations expressing four distinct blood phenotypes.

NODIA

**43.** (B) Only A and B
Inheriting blood types follows mendelian principles. A mother with group O provides only recessive i alleles in her gametes. A father with group AB produces gametes carrying either the dominant IA allele or the dominant IB allele. Offspring must receive one allele from each parent, yielding either IAi or IBi genotypes, expressing phenotype A or phenotype B exclusively.

**44.** (B) One parent is group AB and the other group O
An individual with blood group O possesses the homozygous recessive ii genotype and must inherit an i allele from both biological parents. An AB parent carries IAIB alleles and always passes either IA or IB to offspring. Thus, a child from an AB and O parental combination receives IAi or IBi, making phenotype O biologically impossible.

**45.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Co-dominance occurs when two different alleles at the same genetic locus are both fully expressed in heterozygous individuals. In blood group AB, an individual inherits one IA allele and one IB allele. Both alleles direct the synthesis of their respective functional glycosyltransferase enzymes, resulting in equal expression of both A and B carbohydrate antigens on erythrocyte membranes.

**46.** (A) Chromosome 9
The ABO blood group gene locus in humans is located on the long arm of chromosome 9 at position 9q34.2. This gene encodes glycosyltransferase enzymes that attach specific nucleotide sugars to the precursor H antigen on red blood cell membranes, converting it into either A or B functional surface antigens depending on inherited allelic sequence variations.

**47.** (D) Rh system
Erythroblastosis fetalis, also termed hemolytic disease of the fetus and newborn, is primarily caused by maternal-fetal blood group incompatibility involving the Rh antigen system. It occurs when an Rh-negative mother carries an Rh-positive fetus, leading to maternal production of anti-D IgG antibodies that cross the placenta and destroy fetal red blood cells, causing severe fetal anemia.

**48.** (C) Rh-negative mother and Rh-positive father
Hemolytic disease of the newborn develops exclusively when an Rh-negative mother carries an Rh-positive fetus, inherited from an Rh-positive biological father. Transplacental entry of fetal Rh-positive red cells into maternal circulation triggers maternal anti-D antibody production. These IgG antibodies cross the placenta during subsequent Rh-positive pregnancies, attaching to fetal erythrocytes and causing rapid immune destruction.

**49.** (B) Sensitization occurs during delivery, so anti-Rh antibodies form after birth.
During a first pregnancy, fetal red blood cells carrying Rh antigens generally remain separated from maternal circulation by the intact placental barrier. Significant fetomaternal hemorrhage usually occurs during labor and delivery, exposing the mother to fetal cells. Maternal sensitization and anti-D antibody formation happen after delivery, leaving the first child unaffected, while posing severe risks for subsequent pregnancies.

**50.** (A) P-3, Q-1, R-2, S-4
Anti-D immunoglobulin is administered to Rh-negative mothers to prevent immune sensitization. Erythroblastosis fetalis causes severe anemia from fetal red blood cell destruction. Intrauterine transfusion supplies donor red cells directly to an anemic fetus before birth. Jaundice results from elevated serum bilirubin produced when macrophages break down excessively hemolyzed red blood cells.

**51.** (A) Clear fetal Rh-positive RBCs before maternal sensitization occurs
Administering Anti-D immunoglobulin to an unsensitized Rh-negative mother neutralizes fetal Rh-positive red blood cells entering maternal circulation during pregnancy or delivery. These passive antibodies clear fetal erythrocytes from maternal blood before the mother's immune system recognizes the foreign D antigen, thereby preventing active maternal immunization and protecting future Rh-positive pregnancies from hemolytic disease.

**52.** (C) Hyperglycemia
Severe Erythroblastosis fetalis involves extensive antibody-mediated destruction of fetal erythrocytes. Consequent severe anemia triggers extramedullary hematopoiesis and cardiac failure, leading to massive fluid accumulation known as Hydrops fetalis. Elevated neurotoxic unconjugated bilirubin from lysed erythrocytes crosses the blood-brain barrier to cause Kernicterus. However, abnormal elevation of blood glucose level is not a clinical manifestation.

**53.** (B) 18 to 65 years
Guidelines established by the National Blood Transfusion Council in India mandate that voluntary blood donors fall within the eligible age range of eighteen to sixty-five years. First-time donors are typically accepted up to sixty years of age. This regulatory framework ensures donor safety during phlebotomy while safeguarding recipient health through rigorous donor selection criteria.

**54.** (B) 45 kg
Under standard medical and regulatory standards, a voluntary blood donor must weigh a minimum of forty-five kilograms to donate three hundred fifty milliliters of whole blood safely. Donating four hundred fifty milliliters requires a minimum weight of fifty-five kilograms. These weight limits ensure that the collected volume does not exceed fifteen percent of total circulatory blood volume.

**55.** (A) IV, II, III, I
The standard blood donation process follows a systematic sequence to ensure donor safety and product quality. First, the individual completes donor registration. Next, a medical evaluation assesses vital signs and hemoglobin concentration. Once approved, phlebotomy is performed to collect whole blood. Finally, the donor rests and receives post-donation refreshments to recover circulatory volume.

**56.** (B) 3 months
Standard medical guidelines mandate a minimum interval of three months, or ninety days, between whole blood donations for healthy male donors.

Click Here to Buy book on Amazon

This mandatory recovery period allows the body to fully replenish depleted iron stores and rebuild functional erythrocyte levels through bone marrow erythropoiesis before another blood donation can be safely performed without risking donor iron deficiency.

**57.** (D) Testing positive for HIV or Hepatitis B
A positive screening test for blood-borne infectious pathogens like Human Immunodeficiency Virus or Hepatitis B Virus results in permanent deferral from blood donation. This lifetime ban prevents transfusion-transmitted infections and protects vulnerable recipients. Temporary conditions like common colds, dental procedures, or routine vaccinations only require short deferral periods until full recovery occurs.

**58.** (C) 12.5 g/dL
Regulatory standards established by blood transfusion authorities require prospective donors to maintain a minimum hemoglobin concentration of twelve point five grams per deciliter. This baseline check ensures the donor possesses adequate oxygen-carrying capacity and internal iron reserves to donate whole blood safely without suffering post-donation anemia, acute hypoxia, or severe systemic weakness.

**59.** (B) 2°C to 6°C
Whole blood and concentrated red blood cell units collected in blood banks are stored inside monitored medical refrigerators maintained between two and six degrees Celsius. This controlled temperature range significantly slows red cell metabolic decay, limits intracellular potassium leakage, inhibits potential bacterial proliferation, and preserves overall red cell viability during storage prior to patient transfusion.

**60.** (B) I and III only
Blood banks perform mandatory screening on donated blood for major infectious markers, including Hepatitis B, Hepatitis C, HIV, Syphilis, and Malaria, using CPDA-1 solution as an effective anticoagulant and cell preservative. However, stored platelets cannot be kept for one year; they have a maximum shelf life of only five to seven days at room temperature.

**61.** (C) 35 days
When whole blood or packed red blood cells are collected into CPDA-1 anticoagulant solution, which contains citrate, phosphate, dextrose, and adenine, the maximum permitted storage shelf-life is thirty-five days at refrigerated temperatures. Adenine supports cellular adenosine triphosphate synthesis, preserving erythrocyte structural integrity and viability throughout this approved storage period.

**62.** (C) Refrigerated centrifuge
Blood bank component separation relies on specialized refrigerated centrifuges. By spinning whole blood units at precise speed, gravitational force, and temperature settings, components separate according to individual cellular densities. Packed red blood cells settle at the bottom, platelets form a middle buffy coat layer, and cell-free plasma remains at the top, allowing easy automated component extraction.

**63.** (B) 20°C to 24°C
Platelets harvested for transfusion are stored at controlled room temperature between twenty and twenty-four degrees Celsius under constant gentle agitation on automated agitators. Refrigeration causes irreversible structural changes in platelet cell membranes, leading to rapid clearance from recipient circulation. Continuous motion prevents platelet aggregation and maintains structural functional integrity during their short shelf life.

**64.** (C) Coagulation factor deficiencies
Fresh Frozen Plasma contains all soluble blood plasma proteins, including both labile and non-labile clotting factors. Clinically, it is primarily transfused to replace multiple plasma coagulation factor deficiencies, manage acute massive hemorrhage, reverse warfarin-induced anticoagulation, and treat conditions like severe liver disease or disseminated intravascular coagulation associated with active abnormal bleeding.

**65.** (A) I, II and III only
Hemostasis involves a enzymatic cascade where damaged tissues release thrombokinase, converting inactive prothrombin into active thrombin. Thrombin then cleaves soluble plasma fibrinogen into insoluble fibrin monomer strands that polymerize to trap circulating blood cells, forming a stable blood clot. Vitamin K, rather than Vitamin C, is essential for hepatic coagulation factor synthesis.

NODIA

classifying them as Rh-positive. The remaining fifteen to twenty percent lack this protein antigen and are Rh-negative, though exact proportions vary across geographic regions and ethnic groups, with higher Rh-negative frequencies observed in European descent populations.

**29.** (A) Immune sensitization resulting in production of anti-D antibodies
When an Rh-negative individual receives Rh-positive red blood cells for the first time, immediate severe hemolysis typically does not occur because pre-existing anti-D antibodies are absent. Instead, foreign D antigens stimulate the recipient's immune system over weeks, causing primary sensitization and production of anti-D IgG antibodies, which poses severe risks during subsequent exposure to Rh-positive blood.

**30.** (A) AB positive → A positive → O negative
In emergency transfusions when exact matching is limited, selecting identical AB positive blood is safest because it avoids foreign antigen exposure. If unavailable, type-specific A positive blood is next best as the recipient lacks anti-A antibodies. Universal O negative blood carries no major antigens and serves as an acceptable alternative when preferred matched units are unavailable.

**31.** (D) O negative
Type O negative blood lacks A, B, and Rh D surface antigens on its red blood cell membranes. Because these erythrocytes do not present major target antigens to recipient antibodies, O negative whole red cell units can be safely transfused into individuals of any ABO and Rh type during life-threatening emergency situations before blood cross-matching is complete.

**32.** (C) They lack anti-A, anti-B, and anti-Rh antibodies in their plasma.
Individuals with AB positive blood express A, B, and Rh D antigens on their red blood cells. Consequently, their immune system recognizes these surface markers as self and does not produce anti-A, anti-B, or anti-D antibodies in plasma. Lacking these circulating agglutinins, they can receive red blood cells of any ABO and Rh group without acute hemolysis.

**33.** (B) Type-specific blood transfusion is always preferred.
Although emergency protocols permit O negative blood administration when recipient blood type is unknown, routine clinical practice strictly mandates transfusing type-specific, cross-matched blood. Matching donor and recipient blood types prevents rare secondary immune reactions, conserves scarce O negative reserves for acute emergencies, and avoids unnecessary exposure to minor non-ABO antigens present on donor cells.

**34.** (D) Group AB
Blood plasma contains soluble antibodies rather than cell surface antigens. Individuals with blood group AB possess both A and B antigens on red cells, so their plasma is entirely free of anti-A and anti-B antibodies. Consequently, AB plasma can be safely transfused into recipients of any blood group without causing antibody-mediated destruction of recipient erythrocytes.

**35.** (B) I and III only
Type O negative red blood cells lack A, B, and D antigens, enabling universal erythrocyte donation. In India, O positive represents the most common blood group demographic. However, AB positive individuals express surface antigens that trigger immune responses in other blood types, meaning AB positive red cells can only be given safely to AB positive recipients.

**36.** (C) Detect recipient antibodies against donor red blood cells
Compatibility cross-matching involves mixing serum from the intended recipient with red blood cells from the donor unit in a laboratory setting. This critical procedure verifies whether the recipient's plasma contains unexpected pre-formed antibodies against donor red cell antigens, thereby preventing acute hemolytic transfusion reactions, severe immune responses, and fatal intravascular complications before transfusion begins.

**37.** (A) AB negative
Direct blood grouping determines cell antigens using specific antisera. Agglutination with Anti-A and Anti-B indicates the presence of both A and B antigens on red blood cell membranes, establishing the ABO blood type as AB. The absence of clumping with Anti-D serum confirms

Downloaded from www.pdf.tube

indicates an abnormally low blood platelet count, predisposing to bleeding. Leukemia represents malignant hematological cancer characterized by uncontrolled proliferation of abnormal, immature white blood cells in bone marrow.

**76.** (B) Pancytopenia
Pancytopenia describes a medical condition characterized by a simultaneous decrease in all three major cellular elements of blood: red cells, white cells, and platelets. Caused by bone marrow aplasia, infiltration, or peripheral destruction, pancytopenia presents clinically with tissue hypoxia from anemia, recurrent systemic infections from leukopenia, and spontaneous cutaneous or mucosal bleeding from thrombocytopenia.

**77.** (A) Lost fluid volume is replaced within 24 to 48 hours.
Following whole blood donation, physiological compensatory mechanisms quickly restore fluid balance. Plasma volume is rapidly replenished within twenty-four to forty-eight hours through fluid absorption from interstitial spaces and increased oral fluid intake. Erythrocyte numbers fully recover within four to six weeks through bone marrow erythropoiesis stimulated by erythropoietin release from kidneys.

**78.** (C) Needle pain is transient and immunity is unaffected.
Blood donation is a safe medical procedure involving minor transient discomfort during venipuncture. Donating a single unit removes only a small fraction of total circulating white blood cells and antibodies, which does not compromise immune function. Cellular immune mechanisms remain completely intact, and lost cellular elements are steadily regenerated by functional bone marrow tissue.

**79.** (D) Zero risk of HIV transmission due to sterile, single-use equipment.
Donating blood carries zero risk of contracting blood-borne viral infections like HIV or Hepatitis. Modern blood collection centers strictly utilize pre-packaged, sterile, single-use disposable needles and collection bags for each individual donor. Equipment is opened immediately before venipuncture and safely discarded afterward, making disease transmission to the blood donor physically impossible.

**80.** (B) Fluid volume recovers within 24-48 hours → Bone marrow is stimulated → RBC count is completely restored within 4-6 weeks
Immediately after blood donation, the body recovers lost plasma fluid volume within twenty-four to forty-eight hours via fluid shifts and hydration. Decreased circulating red cell volume triggers renal erythropoietin secretion, which stimulates bone marrow stem cells to accelerate erythropoiesis, ultimately restoring baseline red cell counts over a period of four to six weeks.

**81.** (B) Women meeting weight and hemoglobin criteria can donate if not pregnant or lactating.
Women can safely participate in voluntary blood donation provided they satisfy standard health screening requirements, including acceptable body weight and minimum hemoglobin levels. Temporary deferral applies during pregnancy, lactation, and immediate post-partum periods to safeguard maternal and infant nutritional reserves, but female gender alone is not a barrier to regular blood donation.

**82.** (D) Plasmapheresis
Plasmapheresis is an apheresis procedure where whole blood is drawn from a donor and separated into cellular and fluid fractions using an automated centrifuge. Plasma is selectively collected into a container, while erythrocytes, leukocytes, and platelets are reinfused back into the donor's circulation, allowing frequent donation with minimal red cell loss.

**83.** (A) Neutralizing antibodies
Convalescent plasma therapy involves collecting blood plasma from individuals who have recently recovered from a specific infectious disease. The plasma contains high titers of pathogen-specific neutralizing antibodies produced during the donor's active immune response. Transfusing this antibody-rich plasma into actively infected patients provides immediate passive immunity to neutralize circulating pathogens and suppress infection.

**84.** (C) Providing immediate oxygen-carrying capacity in severe acute anemia
Blood plasma contains water, electrolytes, albumin, immunoglobulins, and clotting factors, but completely lacks erythrocytes and functional hemoglobin molecules. Therefore, plasma cannot transport oxygen to peripheral tissues. Treating acute severe anemia requires packed red blood cell

NODIA

**66.** (D) Calcium ($Ca_2^+$)
Calcium ions act as Factor IV in the blood coagulation cascade. Calcium is an essential cofactor required for assembling enzymatic complexes on lipid membranes during both intrinsic and extrinsic clotting pathways. It enables activation of prothrombin to thrombin and cross-linking of fibrin monomers, which is why chelating calcium prevents blood clotting in blood bags.

**67.** (A) Factor X (Stuart-Prower factor)
The intrinsic and extrinsic pathways of blood coagulation converge at the common pathway through the activation of Factor X. Activated Factor X combines with Factor V, calcium ions, and phospholipids to form the prothrombinase complex. This complex cleaves inactive circulating prothrombin into active thrombin, which subsequently converts fibrinogen into insoluble fibrin strands.

**68.** (C) Vitamin K
Vitamin K is a essential fat-soluble nutrient that serves as an indispensable cofactor for hepatic gamma-glutamyl carboxylase. This liver enzyme modifies specific glutamate residues on precursor proteins, converting them into active functional coagulation factors, specifically Factors II, VII, IX, and X. Deficiency of Vitamin K impairs clot formation, leading to severe hemorrhagic bleeding disorders.

**69.** (A) Thrombus
A thrombus is an abnormal blood clot formed within the intact cardiovascular system that remains attached to the inner vascular endothelial wall. Thrombosis results from vascular wall injury, stasis of blood flow, or hypercoagulable states. If a thrombus breaks free from its attachment site and travels through the bloodstream, it becomes a circulating embolus.

**70.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Heparin is a potent naturally occurring glycosaminoglycan administered parenterally as an anticoagulant. It binds to antithrombin III, enhancing its ability to rapidly inactivation thrombin and Factor Xa. By blocking key enzymes in the coagulation cascade, heparin prevents pathological blood clot formation and thromboembolic complications during cardiac surgeries, hemodialysis, and prolonged surgical procedures.

**71.** (B) Iron
Iron deficiency represents the single most common cause of nutritional anemia worldwide, disproportionately affecting young children, pregnant individuals, and women of childbearing age. Lack of adequate dietary iron impairs erythrocyte hemoglobin synthesis, resulting in microcytic hypochromic red blood cells, reduced tissue oxygen delivery, chronic fatigue, lethargy, impaired cognitive development, and lowered cellular immunity.

**72.** (C) Vitamin $B_{12}$
Pernicious anemia is an autoimmune disorder characterized by gastric parietal cell destruction, resulting in loss of intrinsic factor secretion. Lacking intrinsic factor, the terminal ileum cannot absorb dietary Vitamin $B_{12}$. This Vitamin $B_{12}$ deficiency impairs deoxyribonucleic acid synthesis during red blood cell maturation, producing abnormally large, fragile erythroblasts and causing severe megaloblastic anemia.

**73.** (D) Factor VIII
Hemophilia A is an X-linked recessive genetic bleeding disorder caused by mutations in the F8 gene, leading to deficiency or functional impairment of blood clotting Factor VIII. Affected individuals experience impaired intrinsic coagulation pathways, resulting in prolonged bleeding episodes, spontaneous joint hemarthroses, deep muscle hematomas, and post-traumatic hemorrhages requiring replacement factor infusions.

**74.** (A) Bone marrow failure causing pancytopenia
Aplastic anemia is a serious hematological disorder characterized by profound bone marrow failure due to destruction of hematopoietic stem cells. The loss of functional marrow tissue leads to pancytopenia, marked by simultaneous reductions in circulating erythrocytes, leukocytes, and platelets. Patients present with severe fatigue from anemia, severe infections from leukopenia, and abnormal mucosal bleeding.

**75.** (A) P-3, Q-4, R-1, S-2
Polycythemia vera is a myeloproliferative disorder marked by excessive red blood cell production. Leukopenia refers specifically to a decrease in circulating white blood cells. Thrombocytopenia

Click Here to Buy book on Flipkart

Research demonstrates that voluntary unpaid donors have a lower prevalence of transfusion-transmissible infections compared to paid or family replacement donors, thereby ensuring a stable, safe, and ethically sustainable national blood supply for medical health systems.

**95.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The Government of India established the National Blood Transfusion Council as the apex policy-formulating body for blood transfusion services. Operating under the Ministry of Health and Family Welfare, NBTC develops national policies, standards, and guidelines to ensure the continuous availability of safe, high-quality blood and blood components across public and private healthcare facilities nationwide.

**96.** (C) Checking real-time blood group availability in nearby blood banks
e-RaktKosh is an integrated web-based blood bank management information system launched by the Government of India. It digitizes blood bank operations, tracks blood component stocks, and provides a public online interface allowing patients, families, and healthcare providers to check real-time availability of specific blood groups across licensed blood centers in nearby locations.

**97.** (B) Central Drugs Standard Control Organization (CDSCO)
Under the Indian Drugs and Cosmetics Act, human blood is legally categorized as a drug. Consequently, licensing and regulation of blood banks fall under the joint jurisdiction of the Central Drugs Standard Control Organization, headed by the Drugs Controller General of India, and State Blood Transfusion Councils, ensuring strict compliance with technical and safety norms.

**98.** (D) Janani Shishu Suraksha Karyakaram
Janani Shishu Suraksha Karyakaram is a flagship initiative of the Government of India designed to eliminate out-of-pocket expenses for pregnant women and sick neonates. A vital component includes providing completely free blood transfusions to pregnant mothers experiencing severe prenatal or postpartum hemorrhage, thereby significantly reducing maternal mortality associated with childbirth complications.

**99.** (A) Dr. Y. M. Bhende
The rare Bombay blood group phenotype was first discovered in 1952 in Bombay, India, by Dr. Y. M. Bhende and his research colleagues. They identified patients whose red blood cells lacked not only A and B antigens, but also the universal precursor H antigen, while possessing strong circulating anti-H antibodies in plasma.

**100.** (A) P-1, Q-3, R-4, S-2
The rare Bombay phenotype lacks A, B, and precursor H antigens entirely. Normal group O erythrocytes possess abundant H antigen without A or B antigens. Group AB displays A, B, and H antigens on cell membranes. The extremely rare Rh-null phenotype completely lacks all defined protein antigens of the Rh blood group system.

**101.** (A) Only another Bombay blood group
Individuals with the Bombay blood group completely lack the H antigen and produce powerful circulating anti-H antibodies. Because standard group O, A, B, and AB red blood cells all express surface H antigens, transfusing any standard ABO blood type causes severe acute intravascular hemolysis. Therefore, Bombay phenotype individuals can safely receive blood only from another Bombay phenotype donor.

**102.** (D) Group O
In routine manual forward typing, red cells are tested with Anti-A and Anti-B antisera. Because Bombay phenotype erythrocytes lack both A and B antigens, no agglutination occurs with either antiserum. Consequently, forward typing falsely categorizes Bombay blood as standard group O, requiring specialized Anti-H lectin testing to identify the true underlying Bombay phenotype.

**103.** (B) Group O blood contains H antigen, triggering strong anti-H antibodies.
Standard group O red blood cells express high concentrations of the unmodified surface H antigen precursor. Bombay phenotype individuals lack H antigen and naturally produce potent, high-titer anti-H IgM antibodies. Transfusing group O blood into a Bombay individual results in immediate binding of anti-H antibodies to donor cells, triggering complement-mediated severe acute intravascular hemolysis.

**104.** (C) Ulex europaeus
Ulex europaeus lectin is a plant-derived seed extract containing anti-H phytohemagglutinin

Downloaded from www.pdf.tube

units rather than plasma transfusions, which are reserved for replacing volume, immunoglobulins, and coagulation proteins.

**85.** (A) I and II only
Plasma comprises approximately ninety percent water and contains no red blood cells. Because red cells are returned during plasmapheresis, donors can donate plasma more frequently than whole blood. However, AB positive individuals express no plasma anti-A or anti-B antibodies, making them universal plasma donors, despite being universal red cell recipients.

**86.** (A) 24 to 48 hours
The human body rapidly restores plasma volume lost during plasmapheresis or standard blood donation within twenty-four to forty-eight hours. Vascular volume expansion occurs through fluid shifts from the extravascular fluid compartment into bloodstream capillaries, combined with renal fluid conservation and normal oral fluid intake, maintaining circulatory hemodynamics without long-term physiological stress.

**87.** (B) Plasma
Human normal immunoglobulin is derived from large pools of human blood plasma collected from healthy donors. Cold ethanol fractionation techniques isolate IgG antibodies from plasma. The resulting concentrated immunoglobulin preparation is administered intravenously or subcutaneously to treat primary immunodeficiency syndromes, autoimmune diseases, and severe acute inflammatory neuropathies by modulating immune responses.

**88.** (C) Known commercial antisera
Forward ABO blood grouping identifies unknown carbohydrate antigens present on patient erythrocytes. In this laboratory procedure, a suspension of patient red blood cells is mixed directly with standardized commercial reagent antisera containing known monoclonal anti-A and anti-B antibodies. Visually observing whether cellular agglutination occurs reveals the specific antigen profile on donor red cells.

**89.** (D) Serum against standard A and B red cells
Reverse ABO blood typing, or serum testing, verifies forward grouping results by detecting naturally occurring isohemagglutinins in plasma. Patient serum or plasma is mixed with standard reagent red blood cells known to carry either A or B antigens. Observing agglutination patterns confirms the reciprocal presence of anti-A or anti-B antibodies in the patient's bloodstream.

NODIA

**90.** (A) I, II and III only
Visible agglutination is red blood cell clumping. Centrifugation in tube testing enhances cell-antibody interaction. Gel card methodology provides improved sensitivity, stability, and standardization compared to slide grouping. However, if a blood sample agglutinates with anti-A serum but not anti-B, the cell membrane possesses A antigens, designating the blood type as group A.

**91.** (B) Agglutination
The primary chemical and physical phenomenon observed during manual slide blood typing is agglutination. When bivalent or multivalent antibodies present in testing antisera bind specifically to matching carbohydrate or protein epitopes on adjacent erythrocyte membranes, cross-linking occurs. This forms macroscopic, visible red blood cell aggregates or clumps across the glass slide surface.

**92.** (B) Anti-D serum
Laboratory determination of Rh blood group status focuses primarily on detecting the presence of the highly immunogenic Rh D surface antigen. Patient red blood cells are mixed directly with commercial Anti-D reagent serum. Visible cellular agglutination indicates D antigen expression on red cell membranes, classifying the blood sample as Rh-positive, whereas absence of clumping indicates Rh-negative blood.

**93.** (A) To verify reagent validity and rule out auto-agglutination
In blood typing protocols, a control slide or well containing patient cells suspended in saline or auto-control reagent is processed simultaneously. This step verifies reagent specificity and ensures that red blood cells are not spontaneously clumping due to cold agglutinins, rouleaux formation, or protein abnormalities, thereby preventing false-positive agglutination interpretations in antigen testing.

**94.** (C) Achieving 100% voluntary non-remunerated blood donation
The World Health Organization actively promotes a global strategy to establish blood safety based on voluntary non-remunerated donations.

**114.** (D) Type O
Observational epidemiological studies conducted during the COVID-19 pandemic indicated that individuals with blood type O had a slightly lower risk of SARS-CoV-2 infection and severe clinical outcomes compared to non-O blood types. Natural anti-A and anti-B antibodies in type O plasma may partially inhibit viral spike protein interactions with host cellular receptors.

**115.** (B) II, III and IV only
Blood group associations reflect relative statistical risks rather than guaranteed disease manifestation. The Duffy antigen acts as a obligate receptor for Plasmodium vivax. ABO antigens are widely expressed on endothelial and mucosal tissues. Additionally, plasma Von Willebrand factor levels are naturally twenty to twenty-five percent lower in blood group O individuals.

**116.** (B) 14th June
World Blood Donor Day is celebrated globally every year on June 14. Established by the World Health Organization, International Federation of Red Cross and Red Crescent Societies, and international transfusion organizations, this annual event raises global awareness regarding the critical necessity of safe voluntary blood and plasma donations for healthcare systems.

**117.** (A) Karl Landsteiner
June 14 was designated as World Blood Donor Day to honor the birth anniversary of Karl Landsteiner, born on June 14, 1868. Landsteiner was the Nobel laureate physician who discovered the human ABO blood group system in 1900 and co-discovered the Rh factor, laying the foundation for modern blood transfusion medicine.

**118.** (A) 1st October
In India, National Voluntary Blood Donation Day is observed annually on October 1st. Initiated in 1975 by the Indian Society of Blood Transfusion and Immunohaematology, this dedicated day focuses on raising awareness nationwide, dispelling common myths surrounding blood donation, and honoring regular voluntary unpaid donors across various Indian states and union territories.

**119.** (B) Raising awareness for regular, voluntary, unpaid blood donation
World Blood Donor Day campaigns organized by the World Health Organization focus on highlighting the essential public health need for regular, voluntary, unpaid blood donations. These global initiatives emphasize community solidarity, express gratitude to voluntary donors, and encourage health authorities to establish sustainable national infrastructure for safe, adequate blood and component supplies.

**120.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Voluntary non-remunerated blood donors constitute the foundation of a safe national blood supply. Epidemiological data confirms that voluntary donors display the lowest prevalence of transfusion-transmissible infections, such as HIV, Hepatitis B, and Hepatitis C, because they donate purely out of altruism without financial incentives or family pressure to hide risky behaviors.

**121.** (D) Blood flows entirely inside a closed network of blood vessels
The human cardiovascular system is designated as a closed circulatory system because blood remains continuously confined within a continuous circuit of specialized blood vessels. Driven by the rhythmic muscular contractions of the heart, blood flows from arteries to arterioles, capillaries, venules, and veins without directly spilling into open body cavities or tissue spaces.

**122.** (A) Internal valves
Human veins, particularly those located in the lower extremities, contain pocket-like internal semilunar valves formed by folds of endothelial tissue. These one-way venous valves permit blood to flow toward the heart while physically preventing retrograde backflow caused by gravity during muscle relaxation, ensuring efficient venous return from lower body tissues to the heart.

**123.** (B) Pulmonary artery
The right ventricle receives deoxygenated systemic venous blood from the right atrium through the tricuspid valve. During ventricular systole, the right ventricle contracts, pumping this deoxygenated blood through the pulmonary semilunar valve into the pulmonary trunk and pulmonary arteries, which transport blood

Click Here to Buy book on Amazon

# CHAPTER 08
# Healthcare

NODIA

**1.** According to the World Health Organization (WHO), how is health formally defined?
(A) A state of being completely free from all communicable and non-communicable diseases
(B) A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity
(C) The physical fitness of an individual and the absence of genetic anomalies
(D) The capacity of an individual to live without relying on public health infrastructure

**2.** Which of the following is NOT considered a core dimension of health according to the World Health Organization (WHO)?
(A) Physical dimension
(B) Mental dimension
(C) Social dimension
(D) Astrological dimension

**3.** In which year did the World Health Organization formally come into existence, an event now commemorated annually as World Health Day?
(A) 1945
(B) 1948
(C) 1950
(D) 1978

**4.** Match the levels of healthcare in List I with their corresponding facilities or examples in List II:
**List I: Level of Healthcare**
P. Primary Healthcare
Q. Secondary Healthcare
R. Tertiary Healthcare
S. Quaternary Healthcare
**List II: Facility / Example**
1. Highly specialized experimental medicine and advanced research
2. Sub-centres and Primary Health Centres (PHCs)
3. Specialized Medical College Hospitals
4. District Hospitals and Community Health Centres (CHCs)

(A) P-4, Q-2, R-1, S-3
(B) P-2, Q-3, R-4, S-1
(C) P-2, Q-4, R-3, S-1
(D) P-3, Q-4, R-2, S-1

**5.** The concept of "Positive Health" primarily implies which of the following?
(A) Optimal functioning of body and mind in a balanced environment
(B) Permanent operational independence from any medical intervention
(C) Having verified positive biological status for health antibodies
(D) Complete global eradication of all infectious disease pathogens

**6.** What is the standard population norm for establishing a Sub-centre in plain areas under India's rural health infrastructure guidelines?
(A) 1,000
(B) 3,000
(C) 5,000
(D) 10,000

**7.** Consider the following statements:
**Assertion (A):** Community Health Centres (CHCs) act as first referral units for Primary Health Centres (PHCs).
**Reason (R):** CHCs are equipped with specialist doctors (like surgeons, physicians, gynecologists, and pediatricians) and typically have 30 indoor beds.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**8.** What is the primary characteristic that distinguishes secondary healthcare from primary healthcare in India's public health system?
(A) Serving as the initial point of contact between community members and medical officers
(B) Delivering highly experimental super-specialty surgical procedures in tertiary centers

**133.** (A) A registered Medical Officer
Under legal regulations in India governing voluntary blood donation camps, all collection activities must be supervised by a licensed, registered Medical Officer. The Medical Officer oversees donor screening, verifies clinical eligibility, manages unexpected adverse phlebotomy reactions, and ensures strict adherence to sterile collection procedures to protect donor safety and blood component quality.

**134.** (D) Motivating voluntary donors and organizing camps under guidelines
Non-governmental public health organizations, such as the Indian Red Cross Society, serve a vital role in supporting national blood programs. They educate communities, mobilize voluntary non-remunerated donors, organize blood donation drives in collaboration with licensed blood centers, and promote ethical practices adhering to guidelines set by regulatory authorities and national blood transfusion councils.

**135.** (A) I and II only
Voluntary blood donation camps are essential for maintaining adequate blood reserves required for emergency surgical and trauma care. They offer free health screenings, including pulse, blood pressure, and hemoglobin checks, to prospective donors. However, camps must strictly enforce age eligibility criteria and are legally prohibited from collecting blood from underage or ineligible individuals.

**136.** (C) The Drugs and Cosmetics Act, 1940
In India, blood and blood components are legally defined as 'drugs' under the Drugs and Cosmetics Act of 1940 and its corresponding rules. Consequently, operating a blood bank, collecting blood, processing components, and conducting transfusion services require mandatory licensing, regular regulatory inspections, and strict adherence to statutory safety and quality control standards.

**137.** (D) Altruism and community solidarity
Modern medical ethics and international public health guidelines emphasize that voluntary, unpaid blood donation driven by altruism and social solidarity represents the highest ethical standard. Donating blood without monetary compensation or material rewards minimizes the temptation for donors to conceal high-risk medical histories, thereby protecting the overall safety and integrity of the national blood supply.

**138.** (A) I, II and III only
A robust voluntary blood donation network significantly reduces maternal mortality from severe obstetric hemorrhage, provides life-saving support for children suffering from malarial anemia, and enables complex organ transplantations and oncological surgical procedures. However, blood transfusion ecosystems do not eradicate vector-borne disease transmission in communities, which requires dedicated public health vector control interventions.

**139.** (B) Pressure may cause donors to hide health risks, raising infection rates.
The World Health Organization discourages family replacement donation because familial pressure or coercion may lead replacement donors to withhold vital information regarding high-risk behaviors or medical histories during screening. This significantly increases the risk of collecting blood during infectious window periods, elevating the incidence of transfusion-transmissible infections compared to voluntary non-remunerated donors.

**140.** (A) II, I, III, IV
Raising community awareness encourages increased voluntary blood donation, especially among young citizens. Increased donor participation leads directly to adequate and stable stocks of safe blood components in regional blood banks. Safe blood availability reduces preventable deaths from severe trauma, surgical bleeding, and obstetric hemorrhage, ultimately enhancing broader public health metrics across communities.

www.nodia.in

Downloaded from www.pdf.tube

**58.** Arrange the following administrative milestones related to mental health in India in chronological order of their introduction:
I. District Mental Health Programme (DMHP)
II. National Mental Health Programme (NMHP)
III. Mental Healthcare Act (MHCA)
IV. National Tele Mental Health Programme (Tele-MANAS)
(A) I, II, III, IV
(B) II, I, III, IV
(C) II, III, I, IV
(D) I, III, II, IV

**59.** Consider the following rights granted to persons with mental illness under the Mental Healthcare Act, 2017:
I. Right to access mental healthcare.
II. Right to free legal services.
III. Right to make an advance directive regarding treatment.
IV. Right to be subjected to unmodified Electroconvulsive Therapy (ECT).
Which of the statements given above is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I, III and IV only

**60.** The 'Rural Health Statistics', a comprehensive annual report detailing health infrastructure and human resources, is published by:
(A) NITI Aayog
(B) Ministry of Health and Family Welfare
(C) Indian Medical Association Headquarters (IMA)
(D) World Health Organization (WHO)

**61.** How is the Maternal Mortality Ratio (MMR) mathematically defined?
(A) Number of maternal deaths per 1,000 live births
(B) Number of maternal deaths per 10,000 live births
(C) Number of maternal deaths per 100,000 live births
(D) Number of maternal deaths per 100,000 women of reproductive age

**62.** The Infant Mortality Rate (IMR) measures the number of infant deaths (children under one year of age) per how many live births?
(A) 100
(B) 1,000
(C) 10,000
(D) 100,000

**63.** Under the Sustainable Development Goals (SDGs), what is the global target for the Maternal Mortality Ratio (MMR) to be achieved by 2030?
(A) Reduce MMR to less than 20 per 100,000 live births
(B) Reduce MMR to less than 70 per 100,000 live births
(C) Reduce MMR to zero
(D) Reduce MMR to less than 150 per 100,000 live births

**64.** What is the specific target for life expectancy at birth as per the National Health Policy 2017?
(A) Increase from 67.5 to 70 years by 2025
(B) Increase average life expectancy from 65 to 75 years by 2025
(C) Increase from 70 to 80 years by 2030
(D) Increase from 60 to 65 years by 2025

**65.** According to the National Health Policy 2017, the Government of India aims to increase health expenditure as a percentage of GDP to what level by 2025?
(A) 1.5%
(B) 2.5%
(C) 4.0%
(D) 5.5%

**66.** Which indicator is defined as the death of a baby after 28 weeks of pregnancy, but before or during birth, and is targeted for reduction under NHP 2017?
(A) Neonatal Mortality Rate
(B) Perinatal Mortality Rate
(C) Stillbirth Rate
(D) Under-5 Mortality Rate

**67.** Consider the following interventions aimed at reducing Infant Mortality Rate (IMR):
I. Kangaroo Mother Care for low birth weight babies.
II. Promotion of exclusive breastfeeding for the first 6 months.
III. Immediate separation of the newborn from the mother for 48 hours.
Which of the statements given above is/are correct?
(A) I and II only
(B) I and III only

NODIA

(C) Providing specialist services as the first referral level for primary care
(D) Delivering basic healthcare services provided exclusively through village ASHA workers

**9.** In the Indian public health system, which facility is generally designated as the First Referral Unit (FRU) for providing comprehensive emergency obstetric and newborn care?
(A) Sub-centre facility
(B) Primary Health Centre
(C) Health and Wellness Centre
(D) Community Health Centre

**10.** Consider the following statements regarding the essential elements of Primary Health Care as outlined in the Alma-Ata Declaration:
I. Provision of essential drugs.
II. Immunization against major infectious diseases.
III. Provision of advanced robot-assisted surgical care.
Which of the statements given above is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**11.** What is the population norm for establishing a Primary Health Centre (PHC) in hilly, tribal, or difficult areas?
(A) 10,000
(B) 20,000
(C) 30,000
(D) 50,000

**12.** Which of the following healthcare personnel forms the core foundation of a rural Sub-centre in India?
(A) Chief Medical Officer of District
(B) ANM and Male Health Worker
(C) Super-specialist Consultant Surgeon
(D) Senior Medical Superintendent

**13.** The National Health Mission (NHM) was created by subsuming which of the following major missions?
(A) National Rural Health Mission and National Urban Health Mission
(B) National Medical Commission and the Indian Nursing Council
(C) Swachh Bharat Mission and the Jal Jeevan Mission Infrastructure
(D) Ayushman Bharat Yojana and Pradhan Mantri Suraksha Bima Yojana

**14.** Arrange the following tiers of the Indian public health system in order from the most peripheral (lowest level) to the highest referral level:
I. District Hospital
II. Sub-centre
III. Community Health Centre (CHC)
IV. Primary Health Centre (PHC)
(A) II, IV, III, I
(B) II, III, IV, I
(C) IV, II, III, I
(D) I, III, IV, II

**15.** At which level does an Accredited Social Health Activist (ASHA) primarily operate?
(A) District level
(B) Block level
(C) Village level
(D) State level

**16.** In which year was the National Rural Health Mission (NRHM) initially launched in India?
(A) 2000
(B) 2005
(C) 2013
(D) 2018

**17.** What is the typical fund-sharing pattern between the Centre and the State for the National Health Mission (NHM) in states like Rajasthan?
(A) 50:50
(B) 60:40
(C) 90:10
(D) 100% centrally funded

**18.** Which of the following is NOT a core strategy under the National Health Mission (NHM)?
(A) Decentralized planning and management
(B) Strengthening of physical health infrastructure
(C) Capacity building of health human resources
(D) Privatization of all public district hospitals

**19.** Consider the following statements:
**Assertion (A):** The National Health Mission integrated various standalone vertical disease control programs into a single umbrella framework.
**Reason (R):** Vertical health programs often lead to duplication of administrative resources and fragmented healthcare delivery at the grassroots level.
(A) Both Assertion (A) and Reason (R) are true

Click Here to Buy book on Flipkart

and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**20.** Consider the following statements regarding the key components of the National Health Mission (NHM):
I. Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A).
II. Health System Strengthening.
III. Control of Communicable Diseases.
IV. Control of Non-Communicable Diseases.
Which of the statements given above is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**21.** Under the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY), what is the maximum health insurance coverage provided per family per year?
(A) Rs. 1 Lakh
(B) Rs. 3 Lakhs
(C) Rs. 5 Lakhs
(D) Rs. 10 Lakhs

**22.** Ayushman Bharat targets the transformation of existing Sub-centres and PHCs into which of the following?
(A) Tertiary Medical Colleges and Research Institutes
(B) Secondary Level District Hospitals
(C) Super Specialty Outpatient Clinics
(D) Health and Wellness Centres (HWCs)

**23.** What is the primary basis for identifying the target beneficiaries under the Ayushman Bharat PMJAY scheme?
(A) Only Below Poverty Line (BPL) ration card holders as of 2020
(B) Socio-Economic Caste Census (SECC) 2011 database
(C) Income tax return filings of the previous year
(D) Aadhar card linkage date

**24.** What is the primary objective of the Janani Suraksha Yojana (JSY)?
(A) To provide free higher education and scholarship benefits to girl children
(B) To offer monthly pension benefits to vulnerable mothers above 60 years
(C) To reduce maternal and infant mortality through institutional delivery
(D) To provide free permanent housing for pregnant women in rural areas

**25.** Under the Janani Suraksha Yojana (JSY), what is the cash assistance provided to a mother from a rural area in a Low Performing State upon institutional delivery?
(A) Rs. 1,000
(B) Rs. 1,400
(C) Rs. 2,000
(D) Rs. 5,000

**26.** Consider the following statements regarding Ayushman Bharat PMJAY:
I. It provides a cover of Rs. 5 lakhs per family per year for secondary and tertiary care hospitalization.
II. There is no cap on family size or age of family members.
III. It covers pre-existing diseases from day one.
Which of the statements given above is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**27.** The Janani Shishu Suraksha Karyakaram (JSSK) entitles pregnant women delivering in public health institutions to which of the following?
(A) A fixed deposit of Rs. 50,000 upon the birth of a girl child
(B) Free delivery, including Caesarean section, and free drugs
(C) Free higher education for the newborn
(D) Subsidized agricultural loans

**28.** Match the public health schemes in List I with their respective launch years in List II:
**List I: Public Health Scheme**
P. National Rural Health Mission (NRHM)
Q. Janani Suraksha Yojana (JSY)
R. National Urban Health Mission (NUHM)
S. Ayushman Bharat PMJAY
**List II: Launch Year**
1. 2005
2. 2005
3. 2013
4. 2018
(A) P-3, Q-1, R-2, S-4

NODIA

(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-3, R-1, S-2
(D) P-2, Q-4, R-3, S-1

**29.** Janani Suraksha Yojana (JSY) classifies Indian states into Low Performing States (LPS) and High Performing States (HPS) primarily on the basis of:
(A) Institutional delivery rates
(B) Literacy rates of females
(C) Per capita income
(D) Availability of multi-specialty hospitals

**30.** Which specific intervention under maternal-child health programmes is designed to identify the causes of maternal deaths and prevent future occurrences?
(A) Pradhan Mantri Matru Vandana Yojana (PMMVY) maternity benefit
(B) Janani Express
(C) Maternal Death Surveillance and Response (MDSR)
(D) LaQshya Initiative

**31.** What was the original core objective of Mission Indradhanush when it was launched by the Government of India?
(A) To eradicate Polio entirely by 2015
(B) To provide comprehensive health insurance coverage for seven critical diseases
(C) To build seven new AIIMS hospitals
(D) Full immunization of children under 2 years and pregnant women

**32.** At its launch in 2014, Mission Indradhanush aimed to protect children against how many vaccine-preventable diseases?
(A) 5
(B) 7
(C) 9
(D) 12

**33.** What does Intensified Mission Indradhanush (IMI) specifically focus on compared to the original Mission Indradhanush?
(A) Introduction of experimental vaccines for adults
(B) Achieving 90% immunization in low-coverage areas
(C) Providing monetary financial compensation for vaccine side effects
(D) Exporting vaccines to developing nations

**34.** Which of the following diseases is NOT among the initial seven diseases targeted under Mission Indradhanush?
(A) Diphtheria
(B) Tetanus
(C) Polio
(D) Dengue

**35.** The Employees' State Insurance Corporation (ESIC) scheme in India is an example of which type of health financing model?
(A) Social Health Insurance
(B) Private Voluntary Health Insurance
(C) Community-based Health Insurance
(D) Out-of-pocket payment

**36.** Choose the correct chronological sequence of the launch of India's major immunization programmes from earliest to most recent:
(A) Universal Immunization Programme (UIP) → Expanded Programme on Immunization (EPI) → Mission Indradhanush → Intensified Mission Indradhanush
(B) Expanded Programme on Immunization (EPI) → Universal Immunization Programme (UIP) → Mission Indradhanush → Intensified Mission Indradhanush
(C) Mission Indradhanush → Expanded Programme on Immunization (EPI) → Universal Immunization Programme (UIP) → Intensified Mission Indradhanush
(D) Universal Immunization Programme (UIP) → Mission Indradhanush → Expanded Programme on Immunization (EPI) → Intensified Mission Indradhanush

**37.** In the context of healthcare financing, what does Out-of-Pocket Expenditure (OOPE) refer to?
(A) Direct payment made by individuals at the time of healthcare service use
(B) The total funds allocated annually by the government for public health out of its budget
(C) The premium paid by the government to insurance companies
(D) The foreign aid received for health programs

**38.** The Rashtriya Swasthya Bima Yojana (RSBY), a precursor to PMJAY, was initially targeted at which segment of the population?
(A) All central government permanent employees
(B) Only corporate employees
(C) Children below the age of 5
(D) Unorganized sector BPL families

NODIA

directly to pulmonary capillaries for oxygenation and carbon dioxide elimination.

**124.** (B) Capillaries
Microscopic capillaries form extensive vascular networks connecting arterioles to venules throughout body tissues. Capillary walls consist of a single delicate layer of endothelial cells supported by a basement membrane. This extremely thin endothelial barrier enables rapid diffusion and exchange of dissolved oxygen, carbon dioxide, nutrients, metabolic waste products, and fluids between blood plasma and interstitial space.

**125.** (A) P-2, Q-3, R-1, S-4
The left atrium receives oxygen-rich blood returning from the lungs via pulmonary veins. The left ventricle pumps oxygenated blood into the systemic circulation through the aorta. Pulmonary veins transport oxygenated blood from pulmonary capillaries to the heart. Coronary arteries branch off the aortic root to supply oxygenated blood directly to the myocardium.

**126.** (C) Sinoatrial (SA) node
The sinoatrial node, situated in the upper posterior wall of the right atrium, functions as the primary physiological pacemaker of the human heart. Composed of specialized autorhythmic cardiac muscle fibers, the sinoatrial node spontaneously generates regular electrical action potentials that spread rapidly through the atrial myocardium, initiating rhythmic atrial and ventricular cardiac contractions.

**127.** (D) Blood pathway from heart to lungs for oxygenation and back
Pulmonary circulation is the dedicated cardiovascular loop responsible for gas exchange. Deoxygenated blood is pumped from the right ventricle through pulmonary arteries to the pulmonary capillary beds surrounding alveolar sacs in the lungs. Here, blood releases carbon dioxide and absorbs oxygen before returning as oxygenated blood via pulmonary veins into the left atrium.

**128.** (C) Oxygen transport and tissue delivery
Medical research into artificial blood substitutes focuses primarily on replicating the vital oxygen-carrying and carbon dioxide-transporting capabilities of natural red blood cells. Synthetic oxygen carriers, such as hemoglobin-based oxygen carriers and perfluorocarbons, are engineered to absorb oxygen in the lungs and release it to oxygen-deprived peripheral tissues during severe acute blood loss emergencies.

**129.** (B) Perfluorocarbons (PFCs)
Perfluorocarbons are synthetic inert fluorinated hydrocarbon compounds evaluated as potential artificial blood substitutes. Due to high gas solubility, PFCs dissolve large quantities of oxygen and carbon dioxide via simple physical diffusion. Emulsified with surfactants, perfluorocarbon fluids circulate in bloodstream microvessels, delivering oxygen efficiently to peripheral tissues independently of functional red blood cells or hemoglobin.

**130.** (A) II, I, IV, III
Blood replacement therapy evolved historically across distinct stages. Early centuries involved unsafe animal-to-human blood transfusions. In 1900, Karl Landsteiner discovered ABO blood groups, making human transfusions safe. Later, citrate anticoagulants were introduced to permit refrigerated blood storage. Modern medical research focuses on developing synthetic Hemoglobin-Based Oxygen Carriers as advanced blood substitutes.

**131.** (A) It eliminates the need for blood typing and cross-matching, saving time.
A primary clinical advantage of artificial blood substitutes, like perfluorocarbon emulsions or hemoglobin-based oxygen carriers, is the complete absence of cell surface ABO and Rh antigens. This allows immediate administration to patients in acute hemorrhagic shock without requiring time-consuming ABO blood typing or compatibility cross-matching, significantly expediting life-saving emergency medical interventions.

**132.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Current synthetic blood substitutes are designed exclusively as short-term fluid oxygen carriers and cannot replicate the complex biological functions of natural whole blood. While these products transport dissolved gases, they completely lack leukocytes for immune defense, blood platelets for primary clot formation, and essential plasma proteins required for coagulation cascades and oncotic pressure maintenance.

Downloaded from www.pdf.tube

(C) I and III only
(D) I, II and III

**49.** Match the health policy or initiative in List I with its distinctive feature or goal in List II:
**List I: Health Policy / Initiative**
P. NHP 1983
Q. NHP 2002
R. NHP 2017
S. Ayushman Bharat
**List II: Feature / Goal**
1. Target to increase public health expenditure to 2.5% of GDP
2. Health for All by 2000
3. Focus on macroeconomic returns of health investment
4. Universal Health Coverage through HWCs and PMJAY
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-1, S-4
(C) P-2, Q-1, R-4, S-3
(D) P-3, Q-2, R-1, S-4

**50.** Which of the following is considered a major challenge regarding the role of the private sector in India's public health landscape?
(A) Over-reliance on traditional medicine
(B) Lack of modern diagnostic technology
(C) Widespread refusal to participate in national medical tourism initiatives
(D) High out-of-pocket costs and weak regulatory compliance

**51.** In the context of India's rural health infrastructure, what does IPHS stand for?
(A) Indian Public Health Standards
(B) International Public Health Systems
(C) Integrated Primary Health Services
(D) Indian Preventive Health Schemes

**52.** According to recent Rural Health Statistics, what is the most significant shortfall in human resources at the Community Health Centre (CHC) level in India?
(A) Shortfall of ASHA workers
(B) Shortfall of multipurpose male health workers in rural sectors
(C) Shortfall of CHC specialist doctors
(D) Shortfall of ambulance drivers

**53.** In which year was the National Mental Health Programme (NMHP) launched in India?
(A) 1982
(B) 1995
(C) 2005
(D) 2017

**54.** What is the central strategy of the District Mental Health Programme (DMHP) launched under the NMHP?
(A) To build large psychiatric asylums in every district
(B) Integrating mental healthcare into district general health services
(C) To strictly separate mental health services from general primary healthcare services
(D) To mandate institutionalization of all patients with depression

**55.** Which progressive provision was introduced by the Mental Healthcare Act, 2017?
(A) Decriminalization of suicide attempts by presuming severe stress
(B) Making mental illness a non-bailable criminal offense
(C) Mandatory use of unmodified electroconvulsive therapy for all patients
(D) Prohibition of all psychiatric medications in rural areas

**56.** Consider the following statements:
**Assertion (A):** A significant "treatment gap" exists in India for mental health disorders, meaning many affected individuals do not receive care.
**Reason (R):** High social stigma, lack of awareness, and a shortage of accessible mental health professionals act as major barriers to seeking treatment.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**57.** Which of the following best describes the primary challenge facing rural health infrastructure in India?
(A) Complete absence of any government policies for rural health
(B) Shortage of medical personnel and inadequate physical infrastructure
(C) An overabundance of super-specialty hospitals causing widespread confusion among patients
(D) Excessive allocation of funds leading to administrative gridlock

NODIA

**39.** Consider the following statements regarding the benefits of public health insurance schemes like Ayushman Bharat:
I. They aim to reduce catastrophic out-of-pocket health expenditure.
II. They provide financial risk protection to vulnerable families.
III. They guarantee completely cashless treatment at empanelled hospitals.
IV. They limit coverage strictly to primary healthcare services only.
Which of the statements given above is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I, III and IV only

**40.** Consider the following statements:
**Assertion (A):** High out-of-pocket healthcare expenditure is a significant factor pushing vulnerable families into poverty in India.
**Reason (R):** Government health insurance schemes like Ayushman Bharat are designed to provide financial risk protection and reduce such expenditures.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**41.** In India, the private healthcare sector currently accounts for approximately what proportion of total outpatient care?
(A) Less than 10%
(B) About 30%
(C) About 50%
(D) Over 70%

**42.** What is the main objective of the Clinical Establishments (Registration and Regulation) Act, 2010?
(A) Mandating minimum standards for facilities in healthcare establishments
(B) To nationalize and federally manage all private hospitals operating across India
(C) To ban private medical colleges
(D) To fix the salaries of doctors in private hospitals

**43.** Contracting out diagnostic services (such as MRI and CT scans) in a government hospital to a private agency is an example of:
(A) Complete privatization
(B) Public-Private Partnership (PPP)
(C) Social Health Insurance
(D) Corporate Social Responsibility initiative

**44.** What was the central overarching goal of India's first National Health Policy formulated in 1983?
(A) Eradicating HIV/AIDS by 1990
(B) Achieving 'Health for All' by the year 2000
(C) Introducing universal free health insurance
(D) Promoting medical tourism

**45.** Which major recommendation influenced the National Health Policy 2002 to focus significantly on increasing public health investment and tackling major diseases?
(A) Commission on Macroeconomics and Health Report
(B) The comprehensive Bhore Committee Report on Health Development
(C) The Mudaliar Committee Report
(D) The Alma-Ata Declaration

**46.** World Health Day is celebrated on April 7th every year to mark the anniversary of which event?
(A) The first successful polio vaccination
(B) The eradication of smallpox
(C) Founding of the World Health Organization in 1948
(D) The signing of the historic international Alma-Ata Declaration

**47.** India's National Health Policy has been formulated and revised in which of the following years?
(A) 1983, 2002, 2017
(B) 1950, 1990, 2010
(C) 1978, 2000, 2020
(D) 1995, 2005, 2015

**48.** Consider the following statements regarding the key principles of the National Health Policy 2017:
I. Equity and Affordability.
II. Pluralism (AYUSH integration).
III. Patient-centered and Quality of Care.
Which of the statements given above is/are correct?
(A) I and II only
(B) II and III only

Click Here to Buy book on Amazon

(C) II and III only
(D) I, II and III

**68.** The National Health Policy 2017 marks a significant paradigm shift in India's healthcare approach. Which of the following best describes this shift?
(A) Shift from preventive health to exclusively curative super-specialty care
(B) Shift from sick care to wellness and comprehensive primary healthcare
(C) Shift from public funding to 100% out-of-pocket funding
(D) Shift from integrating AYUSH to banning traditional medicine

**69.** Consider the following statements:
**Assertion (A):** Promoting institutional deliveries is a primary strategy for reducing the Maternal Mortality Ratio (MMR) in India.
**Reason (R):** Institutional deliveries ensure that skilled birth attendants are present to manage complications like postpartum hemorrhage or eclampsia.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**70.** What is the primary target group for interventions aiming to reduce the Under-5 Mortality Rate (U5MR)?
(A) Children between 5 and 10 years of age
(B) Children under 5 years of age
(C) Only infants below 1 year
(D) Adolescents below 15 years

**71.** The acronym 'AYUSH' in the context of India's health systems stands for:
(A) Allopathy, Yoga & Naturopathy, Unani, Siddha, and Homeopathy
(B) Ayurveda, Yoga, Unani, Siddha and Homeopathy
(C) Ayurveda, Yoga, Unani, Surgery, and Health
(D) Asian Yoga, Unani, Siddha, and Herbal medicine

**72.** What is the primary objective of the National AYUSH Mission (NAM)?
(A) To replace allopathic medicine entirely with traditional medicine across all hospitals
(B) Promoting cost-effective AYUSH services and strengthening educational quality
(C) To export AYUSH doctors to other countries
(D) To ban the practice of surgery in India

**73.** A key strategy for integrating traditional medicine into the public health system under the National Health Mission is:
(A) Co-location of AYUSH facilities at PHCs and CHCs
(B) Creating entirely separate parallel health ministries in every administrative district
(C) Mandating that allopathic doctors prescribe only AYUSH medicines
(D) Removing allopathic drugs from rural dispensaries

**74.** What is the purpose of the 'eSanjeevani' platform launched by the Ministry of Health and Family Welfare?
(A) To book subsidized railway tickets for patients travelling for specialized medical care
(B) National Telemedicine Service for remote consultations
(C) To order Ayurvedic medicines online
(D) To track the real-time location of ambulances

**75.** In the context of eSanjeevani HWC (Health and Wellness Centre), how does the 'Hub and Spoke' model operate?
(A) HWCs act as Hubs providing specialist care to medical colleges (Spokes)
(B) HWCs (Spokes) connect patients to specialists at District Hospitals (Hubs)
(C) Pharmacies act as central Hubs distributing prescription medicines directly to Spokes (patients' homes)
(D) Urban patients (Spokes) consult rural doctors (Hubs)

NODIA

**76.** Following the COVID-19 pandemic, formal Telemedicine Practice Guidelines were issued in 2020 by the Ministry of Health in consultation with which body?
(A) Indian Council of Medical Research (ICMR) Central Board
(B) NITI Aayog
(C) Medical Council of India (now National Medical Commission)
(D) Pharmacy Council of India

**77.** What is the core feature of the Ayushman Bharat Digital Mission (ABDM)?
(A) Issuing a 14-digit ABHA number to link

public healthcare network to manage emergency obstetric and neonatal complications. They are equipped with emergency operating theatres, blood storage facilities, 30 inpatient beds, and specialist doctors such as obstetricians, pediatricians, and anesthetists necessary for delivering comprehensive emergency maternal care.

**10.** (A) I and II only
The historic 1978 Alma-Ata Declaration outlined core essential elements of primary healthcare, including mass immunization against major infectious diseases, provision of essential drugs, maternal and child healthcare, and health education. Highly advanced procedures like robot-assisted surgery belong strictly to specialized tertiary or quaternary care facilities and fall outside primary healthcare frameworks.

**11.** (B) 20,000
A Primary Health Centre serves as the first contact point between a rural community and a qualified medical officer. According to Indian Public Health Standards guidelines, a Primary Health Centre is established to cover a population of 30,000 in general plain areas, while a reduced norm of 20,000 population applies in hilly, tribal, or difficult geographical terrain.

**12.** (B) ANM and Male Health Worker
A Sub-centre is the most peripheral healthcare facility in rural India. It is primarily staffed by an Auxiliary Nurse Midwife, also known as a Female Health Worker, along with a Male Health Worker. Together, these healthcare workers provide basic maternal and child health services, family welfare planning, disease surveillance, and immunization to the local community.

**13.** (A) National Rural Health Mission and National Urban Health Mission
The National Health Mission was established by the Cabinet in 2013 by combining two existing umbrella programs: the National Rural Health Mission, launched in 2005, and the newly formulated National Urban Health Mission. This consolidation aimed to address healthcare needs across both rural and urban populations through a unified, decentralized administrative framework.

**14.** (A) II, IV, III, I
The Indian public healthcare system is organized in a clear hierarchical order based on population coverage and medical capability. The Sub-centre operates at the most peripheral level, followed by the Primary Health Centre, then the Community Health Centre functioning as a secondary referral unit, and finally the District Hospital serving as the top tertiary level.

**15.** (C) Village level
An Accredited Social Health Activist is a trained female community health volunteer selected directly from the village community where she resides. Operating strictly at the village level, she acts as a crucial liaison between the local rural population and the public health system, promoting institutional delivery, child immunization, nutrition, and hygiene practices.

**16.** (B) 2005
The National Rural Health Mission was officially launched by the Prime Minister of India on April 12, 2005. Its primary mandate was to undertake systemic architectural corrections in the public healthcare delivery system, particularly strengthening rural health infrastructure and improving healthcare access for vulnerable, underserved populations living in rural areas.

**17.** (B) 60:40
Funding for the National Health Mission is shared between the Central Government and State Governments based on pre-defined ratios. For standard general category states like Rajasthan, the standard fund-sharing pattern is 60 percent from the Centre and 40 percent from the State, whereas North-Eastern and Himalayan states receive a 90:10 funding ratio.

**18.** (D) Privatization of all public district hospitals
Key strategies under the National Health Mission include decentralized health planning, strengthening public physical health infrastructure, promoting community-based management, and building capacity among health human resources. The mission focuses on strengthening and expanding public health facilities rather than privatizing public district hospitals, which remain core foundational components of government healthcare delivery.

Downloaded from www.pdf.tube

**87.** Choose the correct chronological sequence of the launch of major state health schemes in Rajasthan:
(A) Mukhyamantri Nishulk Dava Yojana → Mukhyamantri Nishulk Janch Yojana → Nirogi Rajasthan Abhiyan → Mukhyamantri Chiranjeevi Swasthya Bima Yojana
(B) Mukhyamantri Nishulk Janch Yojana → Mukhyamantri Nishulk Dava Yojana → Mukhyamantri Chiranjeevi Swasthya Bima Yojana → Nirogi Rajasthan Abhiyan
(C) Nirogi Rajasthan Abhiyan → Mukhyamantri Nishulk Dava Yojana → Mukhyamantri Nishulk Janch Yojana → Mukhyamantri Chiranjeevi Swasthya Bima Yojana
(D) Mukhyamantri Nishulk Dava Yojana → Nirogi Rajasthan Abhiyan → Mukhyamantri Nishulk Janch Yojana → Mukhyamantri Chiranjeevi Swasthya Bima Yojana

**88.** What is the primary focus of the 'Nirogi Rajasthan Abhiyan' launched by the Government of Rajasthan?
(A) Providing highly specialized elective surgical treatments in advanced hospitals abroad
(B) Preventive healthcare and disease screening for the population
(C) Eradication of wild polio virus from the state
(D) Distributing free smartphones to pregnant women

**89.** Which unique milestone did Rajasthan achieve in 2022-23 regarding healthcare legislation in the state assembly?
(A) Passing the Right to Health Act for free emergency care
(B) Abolishing all private medical colleges in the state
(C) Making physical fitness and wellness certificates mandatory for all state residents
(D) Withdrawing from the National Health Mission

**90.** The 'Shuddh Ke Liye Yuddh' campaign in Rajasthan is primarily associated with which aspect of public health?
(A) Eradicating mosquito breeding sites
(B) Combating food adulteration and safety
(C) Promoting blood donation
(D) Reducing urban industrial air pollution in major metropolitan cities

NODIA

**91.** The Swachh Bharat Mission (SBM) has a direct impact on public health primarily by reducing the incidence of which of the following diseases?
(A) Type-2 Diabetes and Essential Hypertension
(B) Diarrheal diseases and soil helminths
(C) Lung cancer and asthma
(D) Alzheimer's disease

**92.** While the first phase of Swachh Bharat Mission focused on Open Defecation Free (ODF) status, ODF Plus (Phase II) focuses primarily on:
(A) Supplying free sanitary napkins
(B) Solid and Liquid Waste Management in villages
(C) Construction of state-of-the-art multi-specialty regional hospitals
(D) Paving all village roads

**93.** POSHAN Abhiyaan (National Nutrition Mission) targets the reduction of stunting, under-nutrition, anemia, and low birth weight. In which year was it launched?
(A) 2014
(B) 2018
(C) 2020
(D) 2022

**94.** The 'Anemia Mukt Bharat' strategy employs the '6x6x6' framework. What do the three 6s stand for?
(A) 6 Target groups, 6 Interventions, and 6 Mechanisms
(B) 6 States, 6 Districts, and 6 Villages
(C) 6 Grams of Iron, 6 times a day, for 6 months
(D) 6 Medical Doctors, 6 Staff Nurses, and 6 ASHA workers per administrative block

**95.** In community health assessments, what color on the Mid-Upper Arm Circumference (MUAC) tape indicates Severe Acute Malnutrition (SAM) in children?
(A) Green
(B) Yellow
(C) Red
(D) Blue

**96.** Prophylactic doses of which vitamin are routinely administered to children under India's national programmes to prevent nutritional blindness (Xerophthalmia)?
(A) Vitamin C
(B) Vitamin D
(C) Vitamin A
(D) Vitamin K

new disease affecting a large population worldwide
(B) Constant presence and usual prevalence of a disease within an area
(C) The complete eradication of a disease from a specific continent
(D) A disease that affects exclusively the animal population

**138.** Which of the following was a central point of contention and a key feature of the Rajasthan Right to Health Care Act, 2022?
(A) Banning all private hospitals and clinics from charging any fees for OPD consultations
(B) Right of residents to free emergency treatment without prepayment
(C) Making organ donation mandatory for all deceased persons
(D) Forcing private doctors to work in public PHCs for 5 years

**139.** In a significant policy update before its restructuring, the Rajasthan Government increased the coverage limit of the Mukhyamantri Chiranjeevi Durghatna Bima Yojana (Accident Insurance) to what amount?
(A) Rs. 2 Lakhs
(B) Rs. 5 Lakhs
(C) Rs. 10 Lakhs
(D) Rs. 25 Lakhs

**140.** In which year was the Revised National Tuberculosis Control Programme (RNTCP) officially renamed as the National Tuberculosis Elimination Programme (NTEP) to align with India's goal to eliminate TB by 2025?
(A) 2015
(B) 2017
(C) 2020
(D) 2022



Click Here to Buy book on Flipkart

Which of the statements given above is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

**108.** The "Rule of Halves" is classically used in epidemiology to describe the burden and treatment gap of which common non-communicable disease?
(A) Tuberculosis
(B) Hypertension
(C) Malaria
(D) Dengue

**109.** Match the health worker / professional in List I with their typical primary facility / level of operation in List II:
**List I: Health Worker / Professional**
P. ASHA
Q. Community Health Officer (CHO)
R. Specialist Doctor (e.g., Surgeon)
S. Chief Medical and Health Officer (CMHO)
**List II: Facility / Level of Operation**
1. Community Health Centre (CHC)
2. District level
3. Village level
4. Health and Wellness Centre (HWC) / Sub-centre
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-2, R-3, S-4

**110.** As per the general norms of the National Health Mission, one ASHA is envisioned to cover what population size in rural areas?
(A) 500
(B) 1,000
(C) 3,000
(D) 5,000

**111.** In the context of Public-Private Partnerships (PPP) in healthcare, what does "contracting in" refer to?
(A) The government directly pays a private corporate entity to construct and operate a private hospital
(B) Engaging private specialists to provide services inside public hospitals
(C) Government doctors are sent to work in private corporate hospitals
(D) The government sells public health land to private builders

**112.** The scheme where government hospitals refer patients to private empanelled laboratories for free CT scans (with the government reimbursing the lab) is an example of which PPP model?
(A) Build-Operate-Transfer (BOT) public infrastructure framework
(B) Outsourcing / Contracting out of services
(C) Social Franchising
(D) Joint Venture

**113.** The National Programme for the Health Care of the Elderly (NPHCE) generally targets providing dedicated healthcare services to citizens above what age?
(A) 50 years
(B) 55 years
(C) 60 years
(D) 75 years

**114.** Under the National Programme for the Health Care of the Elderly (NPHCE), dedicated 10-bedded Geriatric Wards are mandated to be set up at which level of the healthcare system?
(A) Sub-centre
(B) Primary Health Centre (PHC)
(C) Community Health Centre (CHC)
(D) District Hospital

**115.** Which of the following represents a major clinical challenge specific to geriatric (elderly) healthcare?
(A) High incidence and rapid transmission of childhood communicable infectious diseases
(B) Managing multiple co-morbidities and degenerative disorders
(C) Congenital genetic anomalies
(D) High maternal mortality

**116.** Arrange the following levels of disease prevention in the chronological order of disease progression (from earliest intervention to latest):
I. Tertiary Prevention (Rehabilitation)
II. Primordial Prevention (Addressing underlying risk factors)
III. Secondary Prevention (Early diagnosis and treatment)
IV. Primary Prevention (Specific protection and health promotion)
(A) II, IV, III, I
(B) IV, II, III, I
(C) II, III, IV, I
(D) IV, III, II, I

Downloaded from www.pdf.tube

**117.** Which legislation in India places a legal obligation on children and heirs to provide maintenance to senior citizens, thus indirectly supporting their health and well-being?
(A) The Epidemic Diseases Act, 1897
(B) The Clinical Establishments (Registration and Regulation) Act, 2010
(C) The Maintenance and Welfare of Parents and Senior Citizens Act, 2007
(D) The Medical Termination of Pregnancy Act, 1971

**118.** Regional Geriatric Centres (RGCs), providing specialized tertiary care for the elderly under the NPHCE, are primarily established in:
(A) Selected Regional Medical Colleges
(B) Every Primary Health Centre across all districts
(C) Rural Sub-centres
(D) Anganwadi centres

**119.** How does the World Health Organization define 'Active Ageing'?
(A) The continuous process of keeping older citizens actively employed in demanding physical labor indefinitely
(B) Optimizing opportunities for health, participation, and security to enhance quality of life as people age
(C) Forcing the elderly to participate in daily high-intensity sports
(D) Refusing medical care to the elderly to promote natural resilience

**120.** Consider the following potential benefits of adopting a Public-Private Partnership (PPP) model in the health sector:
I. Leveraging private sector efficiency and advanced technology.
II. Supplementing the limited infrastructure of the public sector.
III. Expanding the reach of specialized diagnostic services to underserved areas.
Which of the statements given above is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**121.** What is the overarching goal of Sustainable Development Goal 3 (SDG-3)?
(A) Achieve universal primary education
(B) Ensure healthy lives and well-being for all at all ages
(C) Ensure availability and sustainable management of water and sanitation for all
(D) End poverty in all its forms everywhere

**122.** Under SDG 3, the target is to end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases by which year?
(A) 2025
(B) 2030
(C) 2035
(D) 2050

**123.** The SDG 3.2 target aims to reduce neonatal mortality to at least as low as:
(A) 12 per 1,000 live births
(B) 25 per 1,000 live births
(C) 30 per 1,000 live births
(D) 50 per 1,000 live births

**124.** What does IDSP stand for in the context of India's epidemic preparedness and disease monitoring?
(A) Indian Disease Strategy Programme
(B) Integrated Disease Surveillance Programme
(C) International Disease Standard and Response Protocol
(D) Integrated Dengue Screening Programme

**125.** The transition from IDSP to the Integrated Health Information Platform (IHIP) offers which major advantage for epidemic preparedness?
(A) It relies exclusively on paper-based weekly reports
(B) Real-time, case-based digital outbreak reporting via mobile devices
(C) It stops the surveillance of non-communicable diseases
(D) It transfers primary public health monitoring authority directly to the World Health Organization

NODIA

**126.** The Epidemic Diseases Act, invoked widely during the COVID-19 pandemic to mandate public health measures, was originally enacted in which year?
(A) 1897
(B) 1947
(C) 1956
(D) 2005

**127.** Which national law empowers the Central Government to establish the National Disaster Management Authority (NDMA), which plays

a crucial role during severe national health emergencies?
(A) The Epidemic Diseases Act, 1897
(B) The Disaster Management Act, 2005
(C) The Public Health Act, 1955
(D) The Essential Commodities Act, 1955

**128.** The 'One Health' approach, critical for epidemic preparedness against zoonotic diseases, emphasizes the interconnectedness of:
(A) Human health, animal health, and the environment
(B) Allopathic, Ayurvedic, and Homeopathic medicine
(C) Primary, Secondary, and Tertiary care facilities
(D) Public hospitals, private clinics, and pharmacies

**129.** Consider the following core capacities required for epidemic preparedness under the International Health Regulations (IHR):
I. Surveillance and risk assessment.
II. Risk communication and community engagement.
III. Laboratory capacity for rapid confirmation.
IV. Imposing permanent international trade embargoes on affected nations.
Which of the statements given above is/are correct?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I, III and IV only

**130.** Choose the correct sequential order of the initial steps taken during an epidemiological outbreak investigation:
(A) Verify the diagnosis → Confirm the existence of an outbreak → Define and identify cases → Formulate a hypothesis
(B) Formulate a hypothesis → Verify the diagnosis → Confirm the existence of an outbreak → Define and identify cases
(C) Confirm the existence of an outbreak → Formulate a hypothesis → Define and identify cases → Verify the diagnosis
(D) Define and identify cases → Formulate a hypothesis → Verify the diagnosis → Confirm the existence of an outbreak

**131.** Following the Medical Termination of Pregnancy (Amendment) Act 2021, what is the maximum gestational limit for terminating a pregnancy for special categories of women (such as survivors of rape)?
(A) 12 weeks
(B) 20 weeks
(C) 24 weeks
(D) 28 weeks

**132.** The Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act was enacted primarily to arrest the decline of which demographic indicator?
(A) Maternal Mortality Ratio
(B) Infant Mortality Rate
(C) Child Sex Ratio
(D) Life Expectancy at Birth

**133.** The Village Health Sanitation and Nutrition Day (VHSND) is typically organized at the Anganwadi centre how frequently?
(A) Once a week
(B) Once a month
(C) Once every six months
(D) Once a year

**134.** Under the Ayushman Bharat scheme, who leads the primary healthcare team at a Health and Wellness Centre (HWC) operating at the Sub-centre level?
(A) Chief Medical Officer of District (CMO)
(B) Community Health Officer (CHO)
(C) ASHA Sahyogini
(D) Anganwadi Worker (AWW)

**135.** The Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) ensures fixed-day, free, and quality antenatal care to pregnant women on which day of every month?
(A) 1st
(B) 9th
(C) 15th
(D) 25th

**136.** Which of the following is a mandatory clinical capability for a health facility to be designated as a First Referral Unit (FRU)?
(A) Performing open-heart surgery
(B) Operating a round-the-clock specialized 24-hour pharmacy for cancer drugs
(C) Providing 24-hour Emergency Obstetric Care and blood storage
(D) Conducting clinical trials for new vaccines

**137.** In epidemiology, what does the term 'Endemic' refer to?
(A) The sudden uncontrolled outbreak of a

Click Here to Buy book on Amazon

digital health records
(B) Providing free high-speed smartphones to all low-income rural households
(C) Creating a digital currency for paying medical bills
(D) Digitizing ancient medical texts

**78.** How many digits are there in the ABHA (Ayushman Bharat Health Account) number assigned to an individual?
(A) 10
(B) 12
(C) 14
(D) 16

**79.** Match the digital health initiatives in List I with their specific functions in List II:
**List I: Digital Health Initiative**
P. CoWIN
Q. NIKSHAY
R. eSanjeevani
S. ABHA
**List II: Function**
1. Tuberculosis (TB) patient management system
2. Digital health ID for individuals
3. Telemedicine and tele-consultation
4. COVID-19 vaccination registration and tracking
(A) P-4, Q-1, R-3, S-2
(B) P-1, Q-4, R-2, S-3
(C) P-4, Q-2, R-3, S-1
(D) P-3, Q-1, R-4, S-2

**80.** Consider the following statements regarding the benefits of telemedicine in rural areas:
I. It overcomes geographical barriers to accessing specialist care.
II. It significantly reduces travel time and out-of-pocket expenses for patients.
III. It facilitates early diagnosis and timely management of diseases.
IV. It completely eliminates the need for physical surgical interventions.
Which of the statements given above is/are correct?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**81.** On which date was the ambitious 'Mukhyamantri Chiranjeevi Swasthya Bima Yojana' launched in Rajasthan?
(A) 1st January 2020
(B) 1st May 2021
(C) 15th August 2021
(D) 2nd October 2022

**82.** What was the final maximum health insurance cover limit per family per year provided under the Mukhyamantri Chiranjeevi Swasthya Bima Yojana before subsequent policy revisions?
(A) Rs. 5 Lakhs
(B) Rs. 10 Lakhs
(C) Rs. 15 Lakhs
(D) Rs. 25 Lakhs

**83.** Under the Mukhyamantri Chiranjeevi Swasthya Bima Yojana, which of the following categories of beneficiaries received completely free insurance coverage (premium fully paid by the State)?
(A) National Food Security Act (NFSA) eligible families
(B) Small and Marginal Farmers (SMF)
(C) COVID-19 ex-gratia recipient families
(D) All of the above

NODIA

**84.** For families not falling under the free categories in the Mukhyamantri Chiranjeevi Swasthya Bima Yojana, what was the annual premium payable to avail the scheme benefits?
(A) Rs. 500
(B) Rs. 850
(C) Rs. 1,000
(D) Rs. 1,500

**85.** In addition to health insurance, the Rajasthan government introduced the 'Mukhyamantri Chiranjeevi Durghatna Bima Yojana'. What was the maximum accidental insurance cover provided under this scheme?
(A) Rs. 2 Lakhs
(B) Rs. 5 Lakhs
(C) Rs. 10 Lakhs
(D) Rs. 20 Lakhs

**86.** The Rajasthan Government Health Scheme (RGHS) was specifically launched to provide medical facilities primarily to which group?
(A) Below Poverty Line (BPL) families only
(B) Agricultural farmers and unorganized sector laborers across the state
(C) Serving and retired state government employees and MLAs
(D) School children under age 14

# ANSWERS

**1.** (B) A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity
The World Health Organization defined health in the preamble to its constitution adopted in 1946. This comprehensive definition shifts the concept of health beyond mere clinical diagnosis or physical disability. It emphasizes a holistic framework integrating physical vitality, psychological equilibrium, and social adaptability necessary for individuals to function effectively within society.

**2.** (D) Astrological dimension
Public health frameworks establish physical, mental, and social dimensions as the core foundational pillars of overall human health. Additional recognized dimensions include emotional, spiritual, and occupational aspects of well-being. Unscientific concepts such as astrological factors are excluded from standard WHO health definitions and medical frameworks because they lack empirical, evidence-based scientific support.

**3.** (B) 1948
The World Health Organization was formally established when its constitution came into force on April 7, 1948. This historic date is now commemorated across the globe every year as World Health Day. As a specialized agency of the United Nations, the organization works globally to promote health, keep the world safe, and serve vulnerable populations.

**4.** (C) P-2, Q-4, R-3, S-1
Primary healthcare operates through peripheral units like Sub-centres and Primary Health Centres for basic care. Secondary healthcare relies on District Hospitals and Community Health Centres to handle referred clinical cases. Tertiary healthcare involves specialized medical college hospitals for advanced interventions, while quaternary healthcare represents highly specialized, experimental medicine and cutting-edge medical research operations.

**5.** (A) Optimal functioning of body and mind in a balanced environment
Positive health represents a state of optimal physical, mental, and social functioning where an individual adapts efficiently to environmental changes. Rather than simply describing the absence of biological disease, this concept focuses on maximizing individual capacity, bodily resilience, psychological well-being, and social harmony within a healthy, supportive, and protective ecological environment.

**6.** (C) 5,000
Under the public health infrastructure guidelines in India, a Sub-centre is designed to serve as the most peripheral contact point between the primary healthcare system and the community. The standard population norm for setting up a Sub-centre is 5,000 people in general plain areas, whereas it is 3,000 in hilly, tribal, or difficult areas.

**7.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Community Health Centres are designed to act as First Referral Units for cases referred from Primary Health Centres. This referral role is directly fulfilled because Community Health Centres are staffed with medical specialists, including surgeons, physicians, obstetricians, and pediatricians. They are also equipped with 30 indoor patient beds, laboratory services, and surgical facilities.

**8.** (C) Providing specialist services as the first referral level for primary care
Secondary healthcare serves as the intermediate tier in the healthcare delivery system, bridge-linked between primary and tertiary levels. It is defined by providing specialized medical consultations and inpatient services at facilities such as District Hospitals and Community Health Centres. These facilities accept cases referred from peripheral primary health centers for expert diagnosis and management.

**9.** (D) Community Health Centre
Community Health Centres are upgraded and designated as First Referral Units within the

Downloaded from www.pdf.tube

**97.** Consider the following waterborne and sanitation-related diseases:
I. Cholera
II. Typhoid
III. Ischemic Heart Disease
Which of the statements given above represents diseases whose transmission is reduced by WASH (Water, Sanitation, and Hygiene) interventions?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**98.** Under the Weekly Iron and Folic Acid Supplementation (WIFS) programme, who are the primary target beneficiaries?
(A) Geriatric senior population above 60 years of age
(B) Adolescent boys and girls aged 10-19
(C) Adult men between 25-45 years
(D) Infants aged 0-6 months

**99.** Consider the following statements:
**Assertion (A):** There is a strong interrelationship between open defecation and high rates of child malnutrition (stunting).
**Reason (R):** Poor sanitation leads to recurrent gastrointestinal infections and environmental enteropathy, which impair a child's ability to absorb essential nutrients.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**100.** In the context of nutrition, how is 'Stunting' technically defined?
(A) Low weight for height
(B) Low height for age
(C) Low weight for age
(D) High body mass index for age

**101.** What does the acronym ASHA stand for in the Indian public health system?
(A) Auxiliary Social Health Assistant
(B) Accredited Social Health Activist
(C) Association of State Health Administrators
(D) Accredited Sanitary and Hygiene Assistant

**102.** An Auxiliary Nurse Midwife (ANM) is primarily posted at which level of the rural health infrastructure?
(A) District Hospital
(B) Community Health Centre (CHC)
(C) Sub-centre
(D) Medical College

**103.** How is an ASHA worker financially compensated for her work under the National Health Mission?
(A) A fixed regular monthly government salary equivalent to a Grade D permanent employee
(B) Entirely through voluntary donations from the community
(C) Task-based performance incentives for specific health activities
(D) Through a percentage of the medicines sold at the PHC

**104.** The NPCDCS is a major national programme targeting specific diseases. Which of the following diseases is NOT covered under the NPCDCS acronym?
(A) Cancer
(B) Diabetes
(C) Cardiovascular Diseases
(D) Cholera

**105.** Under the Comprehensive Primary Health Care (CPHC) initiative at Health and Wellness Centres, population-based screening for common NCDs (hypertension, diabetes, oral/breast/cervical cancers) is targeted at individuals above what age?
(A) 18 years
(B) 30 years
(C) 45 years
(D) 60 years

NODIA

**106.** Which of the following is considered a major modifiable behavioral risk factor for Non-Communicable Diseases (NCDs)?
(A) Genetic predisposition
(B) Age
(C) Tobacco use
(D) Gender

**107.** Consider the following duties typically performed by an ASHA worker:
I. Escorting pregnant women to health facilities for institutional delivery.
II. Providing Directly Observed Treatment Short-course (DOTS) for TB patients.
III. Creating awareness about basic nutrition and sanitation.
IV. Performing minor surgical procedures like appendectomies.

**19.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The National Health Mission integrated independent vertical programs like tuberculosis, malaria, and reproductive health into a unified system. This structural integration occurred because running separate vertical programs created administrative overlap, inefficient resource utilization, and fragmented service delivery. Combining them streamlined administrative governance, enhanced operational efficiency, and unified healthcare service delivery at peripheral levels.

**20.** (D) I, II, III and IV
The National Health Mission encompasses four primary program components to ensure comprehensive healthcare. These comprise Reproductive, Maternal, Newborn, Child and Adolescent Health alongside Health System Strengthening in both rural and urban areas. Furthermore, the mission actively targets the prevention and control of both communicable and non-communicable diseases across all healthcare levels.

**21.** (C) Rs. 5 Lakhs
Ayushman Bharat Pradhan Mantri Jan Arogya Yojana is a flagship national health protection scheme launched in 2018. It provides financial protection by offering a health insurance cover of Rupees 5 Lakhs per family per year. This coverage applies to secondary and tertiary care hospitalization across empanelled public and private hospitals.

**22.** (D) Health and Wellness Centres (HWCs)
One of the two primary pillars of the Ayushman Bharat initiative is transforming existing primary health sub-centres and primary health centres into Health and Wellness Centres. These upgraded facilities deliver Comprehensive Primary Health Care, expanding basic maternal services to include non-communicable disease screenings, free essential drugs, diagnostic services, and wellness activities.

**23.** (B) Socio-Economic Caste Census (SECC) 2011 database
Beneficiary identification for Ayushman Bharat PMJAY relies on occupational and deprivation criteria derived from the Socio-Economic Caste Census 2011 database. This methodology targets the bottom 40 percent of India's population, covering around 12 crore vulnerable households in rural and urban areas without requiring a separate enrollment or application process.

**24.** (C) To reduce maternal and infant mortality through institutional delivery
Janani Suraksha Yojana is a safe motherhood intervention launched under the National Health Mission. Its core objective is reducing maternal and neonatal mortality by promoting institutional deliveries among poor pregnant women. The scheme provides conditional cash assistance to eligible mothers who deliver in public health institutions or accredited private facilities.

**25.** (B) Rs. 1,400
Under the Janani Suraksha Yojana, financial assistance varies according to geographic area and state performance classification. In Low Performing States, a rural mother delivering in a public or accredited private medical institution receives a direct cash incentive of Rupees 1,400, alongside an incentive for the accompanying ASHA worker to cover logistics.

**26.** (D) I, II and III
Ayushman Bharat PMJAY provides an annual cover of Rupees 5 lakhs per family for secondary and tertiary hospitalization. The scheme has no restriction on family size, age, or gender to prevent exclusion. Additionally, all pre-existing medical conditions are covered from the very first day of enrollment without waiting periods.

**27.** (B) Free delivery, including Caesarean section, and free drugs
Launched in 2011, Janani Shishu Suraksha Karyakaram entitles all pregnant women delivering in public health institutions to completely free deliveries, including Caesarean operations. The entitlement covers free drugs, diagnostics, blood transfusions, and transportation. Sick infants up to one year of age also receive free treatment and care under this initiative.

**28.** (B) P-1, Q-2, R-3, S-4
The National Rural Health Mission and Janani Suraksha Yojana were both launched in 2005 to strengthen rural health delivery and maternal care. The National Urban Health Mission was launched in 2013 to address urban primary health needs. Ayushman Bharat PMJAY was rolled out

Click Here to Buy book on Flipkart

nationwide in 2018 to provide hospitalization insurance.

**29.** (A) Institutional delivery rates
Janani Suraksha Yojana categorizes states into Low Performing States and High Performing States based primarily on their historic institutional delivery rates. States with institutional delivery percentages of 25 percent or lower were classified as Low Performing States to receive higher financial incentives and prioritized maternal welfare interventions under the scheme.

**30.** (C) Maternal Death Surveillance and Response (MDSR)
Maternal Death Surveillance and Response is a critical quality improvement intervention in maternal health care. It involves systematically identifying, reporting, and reviewing every maternal death occurring in facilities or communities. Investigating the medical and social causes enables health systems to take corrective actions and prevent future maternal mortality across clinical networks.

**31.** (D) Full immunization of children under 2 years and pregnant women
Launched by the Ministry of Health and Family Welfare in December 2014, Mission Indradhanush was established to accelerate routine immunization coverage. The initiative specifically aims to achieve full vaccination coverage for all children under two years of age and pregnant women who have been missed or dropped out during routine immunization drives.

**32.** (B) 7
Mission Indradhanush was named after the seven colors of the rainbow to reflect its initial target of protecting children against seven vaccine-preventable diseases. These initial diseases included diphtheria, pertussis, tetanus, poliomyelitis, tuberculosis, measles, and hepatitis B. Subsequent program expansions added vaccines for Japanese encephalitis, Rotavirus, Haemophilus influenzae type B, and Pneumococcus.

**33.** (B) Achieving 90% immunization in low-coverage areas
Intensified Mission Indradhanush was launched in October 2017 to further accelerate full immunization coverage. Unlike routine drives, it specifically focuses on reaching low-coverage urban areas, hard-to-reach pockets, and vulnerable populations. The strategy aims to achieve over 90 percent full immunization coverage in selected low-performing districts and urban centres.

**34.** (D) Dengue
The initial seven vaccine-preventable diseases targeted by Mission Indradhanush were diphtheria, whooping cough, tetanus, polio, tuberculosis, measles, and hepatitis B. Dengue is a mosquito-borne viral disease that was not part of this core immunization list, as routine dengue vaccines were not included in India's Universal Immunization Programme framework.

NODIA

**35.** (A) Social Health Insurance
The Employees' State Insurance Scheme, managed by the Employees' State Insurance Corporation, is a premier social security and health insurance model. Financed through statutory contributions from both employers and employees, it provides comprehensive medical care and cash benefits for sickness, maternity, and employment injury to formal sector workers and dependents.

**36.** (B) Expanded Programme on Immunization (EPI) → Universal Immunization Programme (UIP) → Mission Indradhanush → Intensified Mission Indradhanush
India launched the Expanded Programme on Immunization in 1978, which was redesigned and expanded as the Universal Immunization Programme in 1985. To cover unvaccinated children, Mission Indradhanush was introduced in 2014, followed by Intensified Mission Indradhanush in 2017 to rapidly accelerate coverage in persistently low-performing target districts.

**37.** (A) Direct payment made by individuals at the time of healthcare service use
Out-of-pocket expenditure refers to direct payments made by patients or households to healthcare providers at the point of receiving medical service. This occurs when healthcare costs are not reimbursed or covered by pre-paid mechanisms such as government health schemes or insurance policies, often leading to severe financial hardship for vulnerable families.

**38.** (D) Unorganized sector BPL families
The Rashtriya Swasthya Bima Yojana was launched in 2008 by the Ministry of Labour and Employment to provide health coverage to unorganized sector workers living Below Poverty Line. It provided cashless hospitalization coverage up to Rupees 30,000 per family annually and served as a major precursor to Ayushman Bharat PMJAY.

**39.** (A) I, II and III only
Public health insurance programs like Ayushman Bharat aim to mitigate catastrophic health expenditures, provide financial risk protection, and ensure completely cashless inpatient treatment at empanelled hospitals. However, they focus on secondary and tertiary hospital care rather than limiting coverage strictly to primary care, which is provided separately through wellness centers.

**40.** (B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
High out-of-pocket medical expenditure is a recognized driver pushing millions of vulnerable Indian households into poverty each year. While government insurance programs like Ayushman Bharat are implemented to mitigate these expenses and offer risk protection, the financial strain itself arises from systemic factors such as high drug costs, private sector dominance, and low public spending.

**41.** (D) Over 70%
The private sector plays a highly dominant role in healthcare service delivery in India. According to National Sample Survey data and national health estimates, the private sector caters to over 70 percent of outpatient medical consultations and approximately 60 percent of all inpatient hospitalizations across both urban and rural regions.

**42.** (A) Mandating minimum standards for facilities in healthcare establishments
The Clinical Establishments Act of 2010 was enacted by Parliament to provide for the registration and regulation of all clinical establishments in the country. Its primary objective is to mandate minimum standards for facilities, equipment, and personnel to ensure uniform, quality, and safe healthcare delivery across both public and private health sectors.

**43.** (B) Public-Private Partnership (PPP)
Outsourcing or contracting diagnostic services, such as advanced magnetic resonance imaging and computed tomography scans, inside government hospitals to private diagnostic entities is a classic Public-Private Partnership model. This operational framework enables public health systems to leverage private capital, equipment, and technical expertise without incurring heavy capital expenditure.

**44.** (B) Achieving 'Health for All' by the year 2000
India's first National Health Policy, formulated in 1983 during the era following the 1978 Alma-Ata Declaration, was strongly anchored in primary healthcare principles. Its central goal was to achieve "Health for All" by the year 2000 through the expansion of a nationwide network of primary healthcare facilities and community-based services.

**45.** (A) Commission on Macroeconomics and Health Report
The National Health Policy 2002 was substantially shaped by international and national economic analyses, notably the Report of the Commission on Macroeconomics and Health. This report highlighted the direct link between public health investment and economic growth, prompting policy emphasis on increasing public spending, tackling major disease burdens, and strengthening healthcare delivery.

NODIA

**46.** (C) Founding of the World Health Organization in 1948
World Health Day is celebrated globally on April 7 every year to mark the anniversary of the founding of the World Health Organization in 1948. Each year, the organization selects a specific priority global health theme for the day to draw international awareness to critical public health issues affecting humanity worldwide.

**47.** (A) 1983, 2002, 2017
The Government of India has formulated three National Health Policies to guide health sector planning and development. The first policy was declared in 1983, followed by a revised policy in 2002 to address emerging priorities. The latest National Health Policy was adopted in 2017 to align with Universal Health Coverage goals.

**48.** (D) I, II and III
The National Health Policy 2017 is built upon core guiding principles including equity, affordability, universality, patient-centered care, and high quality of service. Furthermore, it explicitly advocates pluralism by integrating AYUSH traditional systems of medicine into mainstream healthcare delivery alongside allopathic care to improve access and choice for patients.

**49.** (B) P-2, Q-3, R-1, S-4
The 1983 National Health Policy targeted "Health for All by 2000", whereas the 2002 policy focused on macroeconomic returns on health investments. The 2017 policy established a goal to increase public health expenditure to 2.5 percent of GDP. Ayushman Bharat operationalized Universal Health Coverage using Health and Wellness Centres and PMJAY.

**50.** (D) High out-of-pocket costs and weak regulatory compliance
Although India's private health sector is extensive and technologically advanced, it presents major public health challenges. Key issues include high out-of-pocket expenditure for patients, widespread commercialization, variable service quality, and weak regulatory enforcement. These factors frequently result in severe financial hardship and unequal healthcare access for vulnerable socio-economic groups.

**51.** (A) Indian Public Health Standards
Indian Public Health Standards represent a set of uniform benchmarks created to ensure high quality of healthcare delivery across rural public health facilities in India. First brought out in 2007 and periodically updated, these standards prescribe specific norms for infrastructure, human resources, equipment, diagnostics, and operational guidelines from Sub-centres to District Hospitals.

**52.** (C) Shortfall of CHC specialist doctors
Annual Rural Health Statistics consistently highlight a severe shortfall of specialist doctors at Community Health Centres in rural India. According to government data, there is a shortage of over 75 to 80 percent in required medical specialists, including surgeons, physicians, obstetricians, and pediatricians, severely affecting secondary care referral services.

**53.** (A) 1982
The Government of India launched the National Mental Health Programme in 1982 in response to the heavy burden of psychiatric disorders. The programme was established to ensure the availability of basic mental healthcare to all vulnerable populations, promote community participation, and integrate mental health services with general healthcare administration across the country.

**54.** (B) Integrating mental healthcare into district general health services
The District Mental Health Programme was launched under the National Mental Health Programme framework to decentralize psychiatric care. Its central strategy is integrating basic mental healthcare into existing general health delivery systems at the district level. This approach utilizes existing healthcare infrastructure and personnel to provide accessible treatment while reducing social stigma.

**55.** (A) Decriminalization of suicide attempts by presuming severe stress
The Mental Healthcare Act 2017 brought progressive legal reforms to protect the rights of persons with mental illness. Notably, Section 115 effectively decriminalizes attempts to commit suicide by presuming that any individual attempting suicide is suffering from severe stress, thereby mandating government care and treatment rather than criminal prosecution.

**56.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Studies reveal a substantial treatment gap in India, where over 70 to 80 percent of individuals with mental health disorders receive no clinical treatment. This wide gap is directly driven by social stigma, poor public awareness, severe shortages of psychiatrists and clinical psychologists, and unequal distribution of mental health facilities across regions.

**57.** (B) Shortage of medical personnel and inadequate physical infrastructure
Rural health infrastructure in India faces significant challenges including shortages of doctors, specialists, and trained nursing personnel in remote areas. These staffing deficits are compounded by physical infrastructure gaps, non-functional equipment, inconsistent supply of essential medicines, and geographical

Downloaded from www.pdf.tube

accessibility barriers, which together hinder the delivery of quality primary care.

**58.** (B) II, I, III, IV
The National Mental Health Programme was introduced first in 1982, followed by the rollout of the District Mental Health Programme in 1996. Landmark rights-based legislation came with the Mental Healthcare Act in 2017, and the National Tele Mental Health Programme, Tele-MANAS, was launched in 2022 to provide digital mental health services.

**59.** (A) I, II and III only
The Mental Healthcare Act 2017 protects rights of mentally ill individuals, ensuring access to mental health services, free legal aid, and the right to make advance directives. Crucially, the legislation explicitly bans the application of direct or unmodified electroconvulsive therapy, permitting electroconvulsive therapy only under muscle relaxants and anesthesia.

**60.** (B) Ministry of Health and Family Welfare
Rural Health Statistics is an annual official publication released by the Statistics Division of the Ministry of Health and Family Welfare. The report provides detailed empirical data regarding existing health infrastructure, staffing status, operational facilities, and human resource shortfalls across Sub-centres, Primary Health Centres, and Community Health Centres in India.

**61.** (C) Number of maternal deaths per 100,000 live births
Maternal Mortality Ratio measures the risk of maternal death relative to the number of live births. It is defined as the annual number of female deaths from any cause related to or aggravated by pregnancy or its management during pregnancy and childbirth, per 100,000 live births during a given time period.

**62.** (B) 1,000
Infant Mortality Rate is a foundational demographic and public health indicator reflecting socio-economic development, living standards, and child survival. It is defined mathematically as the total number of deaths of infants under one year of age occurring per 1,000 live births within a specific geographic area during a given calendar year.

**63.** (B) Reduce MMR to less than 70 per 100,000 live births
Goal 3 of the United Nations Sustainable Development Goals outlines global health priorities to be achieved by the year 2030. Specifically, Target 3.1 mandates reducing the global Maternal Mortality Ratio to less than 70 maternal deaths per 100,000 live births through improved emergency obstetric care and skilled birth attendance.

**64.** (A) Increase from 67.5 to 70 years by 2025
The National Health Policy 2017 outlines explicit quantitative demographic targets to improve population health status. Among its key health status targets, the policy aims to increase overall life expectancy at birth in India from 67.5 years to 70 years by 2025, supported by reductions in infant, child, and adult mortality rates.

NODIA

**65.** (B) 2.5%
To strengthen the public health framework and provide universal health protection, the National Health Policy 2017 set a target to step up public health spending. The policy proposes increasing government expenditure on health as a proportion of Gross Domestic Product from approximately 1.15 percent to 2.5 percent by the year 2025.

**66.** (C) Stillbirth Rate
Stillbirth is defined by public health standards as fetal death occurring after 28 completed weeks of gestation, but before or during birth. The National Health Policy 2017 explicitly targeted reducing the Stillbirth Rate to a single-digit level per 1,000 total births by 2025 through improved antenatal and intrapartum clinical monitoring.

**67.** (A) I and II only
Evidence-based neonatal interventions to lower infant mortality include continuous skin-to-skin contact via Kangaroo Mother Care for low birth weight infants and promoting exclusive breastfeeding during the first six months. Separating newborns from mothers is harmful as it disrupts immediate thermal regulation, delays bonding, and hinders early initiation of breastfeeding.

**68.** (B) Shift from sick care to wellness and comprehensive primary healthcare
The National Health Policy 2017 marked a major structural pivot in Indian health planning.

education on nutrition and hygiene. As non-physician community volunteers, ASHAs are not medically qualified, trained, or legally authorized to perform invasive surgical procedures like appendectomies.

**108.** (B) Hypertension
The "Rule of Halves" in cardiovascular epidemiology states that only half of all hypertensive individuals in a population are diagnosed, only half of those diagnosed receive medical treatment, and only half of those treated achieve adequate blood pressure control. This rule underscores the significant detection and treatment gap surrounding hypertension.

**109.** (A) P-3, Q-4, R-1, S-2
An ASHA operates at the village level, while a Community Health Officer manages primary care services at a Health and Wellness Centre or Sub-centre. Specialist doctors, such as surgeons and gynecologists, provide referral care at Community Health Centres, whereas Chief Medical and Health Officers handle administration at the district level.

**110.** (B) 1,000
Under the National Health Mission operational norms, one Accredited Social Health Activist is envisaged for every 1,000 population in rural areas. However, in tribal, hilly, or sparsely populated desert regions, this population norm is relaxed to one ASHA per habitation or village to ensure adequate health coverage.

**111.** (B) Engaging private specialists to provide services inside public hospitals
In healthcare management, "contracting in" refers to a public-private partnership mechanism where the government recruits or engages private sector medical specialists or clinical personnel to deliver specialized services directly inside existing public health facilities, leveraging public infrastructure to overcome acute human resource shortages in government hospitals.

**112.** (B) Outsourcing / Contracting out of services
Contracting out refers to a Public-Private Partnership arrangement where a public hospital enters into an agreement with a private service provider to deliver specific diagnostic or clinical services. Patients receive specialized diagnostic tests at empanelled private laboratories for free, while the government directly reimburses the private facility at pre-agreed contractual rates.

**113.** (C) 60 years
The National Programme for the Health Care of the Elderly was launched in 2010 to cater specifically to the health needs of senior citizens. In alignment with national demographic definitions, the programme defines elderly beneficiaries as citizens aged 60 years and above, providing dedicated promotional, preventive, and curative care.

**114.** (D) District Hospital
Under guidelines of the National Programme for the Health Care of the Elderly, dedicated 10-bedded Geriatric Wards are established at District Hospitals. These specialty wards are designed to deliver comprehensive inpatient medical treatment, acute care, rehabilitation, and counseling for elderly patients, supported by dedicated medical officers, physiotherapists, and trained nursing staff.

**115.** (B) Managing multiple co-morbidities and degenerative disorders
A primary clinical challenge in geriatric healthcare is managing multimorbidity, where elderly patients suffer concurrently from multiple chronic degenerative conditions such as hypertension, diabetes, osteoarthritis, and cognitive impairment. Managing these complex overlapping conditions requires coordinated, multi-disciplinary care, cautious prescribing to avoid adverse drug interactions, and long-term functional rehabilitation support.

**116.** (A) II, IV, III, I
Prevention levels follow disease development stages. Primordial prevention acts before risk factors emerge. Primary prevention lowers risk factor exposure through health promotion and immunization. Secondary prevention targets early disease diagnosis and prompt treatment to prevent complications, while tertiary prevention focuses on medical rehabilitation to reduce disability after clinical disease is established.

**117.** (C) The Maintenance and Welfare of Parents and Senior Citizens Act, 2007
The Maintenance and Welfare of Parents and Senior Citizens Act of 2007 provides legal protection for senior citizens in India. It places a statutory duty on adult children or legal heirs

Click Here to Buy book on Amazon

Health Account number for citizens. This digital ID enables individuals to securely store, manage, and share their health records electronically across accredited health providers nationwide.

**78.** (C) 14
The Ayushman Bharat Health Account number generated under the Ayushman Bharat Digital Mission consists of a unique 14-digit identification number. This randomized identifier acts as a digital health key, allowing individuals to link, store, and access their personal health records, diagnostic reports, and prescriptions securely across healthcare providers nationwide.

**79.** (A) P-4, Q-1, R-3, S-2
CoWIN was deployed to register and track COVID-19 vaccinations across India, while NIKSHAY serves as the web-based patient tracking system for tuberculosis control. The eSanjeevani portal provides national telemedicine and virtual consultation services, whereas ABHA provides individuals with a unique 14-digit digital health ID to link health records.

**80.** (A) I, II and III only
Telemedicine in rural regions successfully overcomes geographical distance, significantly lowers travel expenses, and enables early disease screening and diagnosis through specialist consultations. However, virtual technologies cannot replace physical surgical procedures, physical clinical examinations, or emergency trauma operations that strictly require physical presence and hands-on medical intervention at hospitals.

**81.** (B) 1st May 2021
The Government of Rajasthan launched its flagship health insurance initiative, the Mukhyamantri Chiranjeevi Swasthya Bima Yojana, on May 1, 2021. The scheme was introduced to provide comprehensive cashless medical insurance coverage for inpatient hospitalization across empanelled public and private hospitals to ensure universal health coverage within the state.

**82.** (D) Rs. 25 Lakhs
Initially launched with an annual health cover of Rupees 5 Lakhs per family, the Rajasthan government subsequently increased the coverage limit of the Mukhyamantri Chiranjeevi Swasthya Bima Yojana to Rupees 10 Lakhs, and ultimately raised it to Rupees 25 Lakhs per family per year in the State Budget for 2023-24.

**83.** (D) All of the above
Under the Mukhyamantri Chiranjeevi Swasthya Bima Yojana in Rajasthan, the full premium cost was fully paid by the state government for multiple vulnerable categories. These included National Food Security Act beneficiaries, Socio-Economic Caste Census families, small and marginal farmers, contract workers, and families receiving ex-gratia COVID-19 relief assistance.

**84.** (B) Rs. 850
For households in Rajasthan that did not belong to the fully subsidized free categories, the Mukhyamantri Chiranjeevi Swasthya Bima Yojana offered open voluntary enrollment. Such families were enabled to avail the comprehensive health insurance coverage by paying a subsidized annual premium of Rupees 850 per family per year.

**85.** (C) Rs. 10 Lakhs
To complement health insurance, Rajasthan launched the Mukhyamantri Chiranjeevi Durghatna Bima Yojana to provide financial relief in case of accidental deaths or permanent disabilities. The scheme initially provided coverage up to Rupees 5 Lakhs, which was subsequently enhanced to Rupees 10 Lakhs per eligible family in state budget revisions.

NODIA

**86.** (C) Serving and retired state government employees and MLAs
The Rajasthan Government Health Scheme was framed on the pattern of the Central Government Health Scheme. It was introduced to offer cashless medical facilities and diagnostic benefits across public and empanelled private hospitals specifically for serving state government employees, retired pensioners, MLAs, former MLAs, and their eligible dependent family members.

**87.** (A) Mukhyamantri Nishulk Dava Yojana → Mukhyamantri Nishulk Janch Yojana → Nirogi Rajasthan Abhiyan → Mukhyamantri Chiranjeevi Swasthya Bima Yojana
Rajasthan pioneered major public health schemes in sequential order. The Mukhyamantri Nishulk Dava Yojana was introduced in 2011 to provide free medicines, followed by the Mukhyamantri Nishulk Janch Yojana in 2013 for free diagnostics.

The Nirogi Rajasthan Abhiyan launched in 2019 for preventive care, and Chiranjeevi Bima Yojana launched in 2021.

**88.** (B) Preventive healthcare and disease screening for the population
Launched in December 2019, the Nirogi Rajasthan Abhiyan is a state-wide preventive public health campaign. It focuses on population-based disease awareness, early screening, lifestyle management, maternal-child health, and pollution control. The initiative trains community volunteers known as Health Mitras to build mass public awareness regarding communicable and non-communicable diseases.

**89.** (A) Passing the Right to Health Act for free emergency care
Rajasthan became the first state in India to enact the landmark Right to Health Act in March 2023. This statutory legislation grants all state residents the legal right to free outpatient and inpatient care at public health facilities, as well as mandatory free emergency medical treatment across designated private hospitals.

**90.** (B) Combating food adulteration and safety
The 'Shuddh Ke Liye Yuddh' campaign was initiated by the Rajasthan government to protect consumer health by aggressively tackling food adulteration. Under this initiative, joint enforcement teams conduct rigorous quality inspections, collect food samples, and penalize traders engaging in the sale of adulterated milk, dairy products, sweets, and edible oils.

**91.** (B) Diarrheal diseases and soil helminths
The Swachh Bharat Mission directly impacts population health by eliminating open defecation and expanding safe sanitation coverage. Improved access to latrines and clean disposal of fecal waste breaks the fecal-oral transmission pathway, drastically reducing the community incidence of acute diarrheal diseases, cholera, typhoid, and soil-transmitted helminthic infections among children.

**92.** (B) Solid and Liquid Waste Management in villages
While Phase I of the Swachh Bharat Mission Gramin concentrated on constructing household latrines to achieve Open Defecation Free status, Phase II focuses on sustaining ODF behaviors and achieving ODF Plus status. This second phase prioritizes comprehensive Solid and Liquid Waste Management, including plastic waste, greywater, and biodegradable waste treatment.

**93.** (B) 2018
POSHAN Abhiyaan, also recognized as the National Nutrition Mission, was launched by the Prime Minister in March 2018 from Jhunjhunu, Rajasthan. The flagship multi-ministerial initiative aims to improve overall nutritional outcomes for children, pregnant women, and lactating mothers by systematically reducing stunting, undernutrition, anemia, and low birth weight nationwide.

**94.** (A) 6 Target groups, 6 Interventions, and 6 Mechanisms
The Anemia Mukt Bharat strategy utilizes an intensive 6x6x6 operational framework to accelerate anemia reduction across India. This framework specifically encompasses 6 target beneficiary groups, 6 evidence-based strategic interventions including iron-folic acid supplementation and deworming, and 6 institutional mechanisms including supply chain management and digital tracking dashboards.

**95.** (C) Red
Mid-Upper Arm Circumference tape is a standardized screening tool used in community health to evaluate nutritional status in children aged 6 to 59 months. A MUAC reading falling in the Red zone, measuring below 11.5 centimeters, indicates Severe Acute Malnutrition, requiring immediate therapeutic feeding and medical referral.

**96.** (C) Vitamin A
Prophylactic high-dose Vitamin A supplementation is periodically administered to young children under national child survival programmes to prevent nutritional blindness and corneal lesions caused by Xerophthalmia. In addition to preserving eye health, Vitamin A supplementation boosts immune function, thereby reducing childhood morbidity and mortality from measles and diarrhea.

**97.** (A) I and II only
Targeted Water, Sanitation, and Hygiene interventions directly interrupt the fecal-oral transmission route of acute infectious pathogens. Clean drinking water, proper latrine usage, and handwashing drastically decrease outbreaks of

Downloaded from www.pdf.tube

bacterial and viral infections such as cholera and typhoid. Non-communicable conditions like ischemic heart disease are unaffected by sanitation measures.

**98.** (B) Adolescent boys and girls aged 10-19
The Weekly Iron and Folic Acid Supplementation programme specifically targets adolescent boys and girls aged 10 to 19 years enrolled in government schools alongside out-of-school adolescent girls. The initiative provides supervised weekly iron-folic acid tablets along with biannual deworming administration to combat nutritional anemia during rapid growth phases.

**99.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Open defecation exposes young children to persistent fecal pathogens, resulting in recurrent gastrointestinal infections and subclinical environmental enteric dysfunction. This chronic intestinal condition damages gut lining absorption, thereby directly contributing to severe growth faltering, chronic undernutrition, and childhood stunting even when dietary caloric intake appears adequate.

**100.** (B) Low height for age
Stunting is defined in child growth epidemiology as low height-for-age, measuring more than two standard deviations below the WHO Child Growth Standards median. It reflects impaired linear physical growth caused by chronic or recurrent undernutrition, frequent childhood infections, and adverse socio-economic conditions during crucial early child development stages.

**101.** (B) Accredited Social Health Activist
The acronym ASHA stands for Accredited Social Health Activist. Instituted under the National Rural Health Mission in 2005, an ASHA is a trained female health volunteer selected directly from the local village community to raise public awareness on health determinants and mobilize families toward utilizing public health services.

**102.** (C) Sub-centre
An Auxiliary Nurse Midwife is a female village-level health worker in India who forms the backbone of primary healthcare delivery. Posted at the Sub-centre or Health and Wellness Centre level, the ANM provides maternal care, conducts immunizations, delivers family planning services, and supervises local ASHA workers in community outreach.

**103.** (C) Task-based performance incentives for specific health activities
ASHA workers function as voluntary community health activists rather than permanent salaried government employees. Under the National Health Mission, they receive task-based performance incentives for undertaking specific health delivery activities, such as facilitating institutional deliveries, mobilizing children for immunizations, promoting toilet construction, and supporting tuberculosis treatment completion.

NODIA

**104.** (D) Cholera
NPCDCS stands for the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke. It was launched to address the growing epidemic of non-communicable diseases. Cholera is an acute bacterial diarrheal disease caused by Vibrio cholerae and is classified as a communicable disease, excluding it from NPCDCS.

**105.** (B) 30 years
Under the Comprehensive Primary Health Care framework at Health and Wellness Centres, population-based screening for common non-communicable diseases is conducted for all individuals aged 30 years and above. Frontline health workers conduct routine community screenings for hypertension, diabetes, and oral, breast, and cervical cancers using standardized CBAC forms.

**106.** (C) Tobacco use
Non-communicable disease risk factors are divided into non-modifiable factors like age, gender, and genetics, and modifiable behavioral factors. Tobacco use, unhealthy diet, physical inactivity, and harmful alcohol consumption represent primary modifiable risk factors. Modifying these behaviors significantly lowers individual risk for developing cardiovascular disease, chronic respiratory conditions, cancer, and diabetes.

**107.** (A) I, II and III only
ASHA workers perform key community health functions including escorting pregnant women for hospital deliveries, administering DOTS regimens for tuberculosis, and promoting health

It shifted the primary focus away from reactive, hospital-based disease treatment toward proactive wellness, preventive health promotion, and comprehensive primary healthcare delivered through upgraded Health and Wellness Centres to ensure continuous, lifelong population health management.

**69.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Promoting institutional births is a core strategy for lowering maternal mortality because major life-threatening birth complications, such as postpartum hemorrhage, sepsis, and severe pre-eclampsia, require immediate medical management. Health facilities offer skilled birth attendants, emergency obstetric procedures, blood transfusion access, and essential medications necessary to save maternal lives during labor.

**70.** (B) Children under 5 years of age
The Under-5 Mortality Rate measures the probability of a child dying between birth and exactly five years of age, expressed per 1,000 live births. Consequently, targeted public health interventions—such as childhood immunizations, nutritional support programs, and acute respiratory infection management—specifically target children under five years of age to reduce mortality.

**71.** (B) Ayurveda, Yoga, Unani, Siddha and Homeopathy
The official acronym AYUSH stands for five recognized traditional and alternative systems of medicine practiced in India: Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy. These systems are governed and promoted by the Ministry of AYUSH to offer holistic healthcare solutions alongside mainstream modern allopathic medicine across national health networks.

**72.** (B) Promoting cost-effective AYUSH services and strengthening educational quality
The National AYUSH Mission was launched as a Centrally Sponsored Scheme to promote traditional systems of medicine across India. Its core objectives include expanding access to cost-effective AYUSH services, upgrading medical education institutions, ensuring quality control of Ayurvedic and traditional drugs, and integrating traditional medicine into public health networks.

**73.** (A) Co-location of AYUSH facilities at PHCs and CHCs
Under the National Health Mission, mainstreaming traditional medicine is achieved primarily through the co-location of AYUSH facilities at public health institutions. Establishing AYUSH dispensaries and positioning practitioners alongside allopathic teams in Primary Health Centres, Community Health Centres, and District Hospitals provides patients with integrated, choice-based healthcare access under one roof.

**74.** (B) National Telemedicine Service for remote consultations
The eSanjeevani platform is a flagship national telemedicine service developed by C-DAC for the Ministry of Health and Family Welfare. It enables remote doctor-to-doctor and patient-to-doctor consultations, bringing specialized medical advice to citizens in rural and remote locations using digital technology, thereby reducing healthcare expenses and physical travel needs.

**75.** (B) HWCs (Spokes) connect patients to specialists at District Hospitals (Hubs)
The eSanjeevani HWC tele-consultation framework operates via a Hub and Spoke operational design. Peripheral Health and Wellness Centres act as Spokes where Mid-Level Health Providers connect patients virtually to specialist doctors located at tertiary institutions or District Hospitals, which function as central Hubs, ensuring access to specialized care locally.

**76.** (C) Medical Council of India (now National Medical Commission)
In March 2020, official Telemedicine Practice Guidelines were formally published by the Ministry of Health and Family Welfare in partnership with NITI Aayog and the Medical Council of India, now succeeded by the National Medical Commission. These rules legally empower registered medical practitioners to conduct consultations and prescribe medicines using digital tools.

**77.** (A) Issuing a 14-digit ABHA number to link digital health records
The Ayushman Bharat Digital Mission aims to establish a seamless national digital health infrastructure. Its central component is generating a unique 14-digit Ayushman Bharat

Click Here to Buy book on Flipkart

to provide adequate maintenance, shelter, and medical care to elderly parents, establishing special tribunals to settle maintenance claims swiftly.

**118.** (A) Selected Regional Medical Colleges
Under the National Programme for the Health Care of the Elderly, Regional Geriatric Centres are set up in selected premier Regional Medical Colleges across states. These tertiary institutions provide super-specialty geriatric care, lead post-graduate medical research, train healthcare professionals, and act as regional referral hubs for complicated geriatric cases.

**119.** (B) Optimizing opportunities for health, participation, and security to enhance quality of life as people age
The World Health Organization defines active ageing as the process of optimizing opportunities for physical health, social participation, and personal security to enhance quality of life as individuals age. It enables aging populations to realize their potential for physical and social well-being while receiving adequate protection and healthcare support.

**120.** (D) I, II and III
Public-Private Partnerships in the health sector offer multiple strategic benefits, including leveraging private financial capital, operational efficiency, and advanced medical technology. PPP models effectively supplement constrained public sector health infrastructure, rapidly expanding public access to specialized diagnostic, dialysis, and surgical care in remote or underserved geographic regions.

**121.** (B) Ensure healthy lives and well-being for all at all ages
Sustainable Development Goal 3 is dedicated to global health under the United Nations 2030 Agenda for Sustainable Development. Its core mandate is to ensure healthy lives and promote overall well-being for all people at all ages, covering maternal-child health, communicable and non-communicable diseases, universal health coverage, and environmental health risks.

**122.** (B) 2030
Target 3.3 of Sustainable Development Goal 3 explicitly commits member nations to end major infectious disease epidemics by the year 2030. This global target includes eradicating epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases, while also combating hepatitis, waterborne diseases, and other communicable pathogens through strengthened public health measures.

**123.** (A) 12 per 1,000 live births
Target 3.2 of the Sustainable Development Goals aims to eliminate preventable deaths of newborns and children under 5 years of age by 2030. All countries aim to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.

**124.** (B) Integrated Disease Surveillance Programme
The Integrated Disease Surveillance Programme was launched by the Ministry of Health and Family Welfare in November 2004 with World Bank assistance. IDSP established a decentralized, nationwide disease surveillance network in India to detect, monitor, and respond rapidly to epidemic-prone infectious disease outbreaks through regular weekly health facility data reporting.

**125.** (B) Real-time, case-based digital outbreak reporting via mobile devices
Transitioning from traditional IDSP to the web-enabled Integrated Health Information Platform modernizes disease surveillance. IHIP provides real-time, case-based data entry using mobile electronic devices. This advanced digital platform drastically accelerates early outbreak detection, precise geospatial mapping, automated statistical alerts, and rapid containment responses during emerging infectious disease outbreaks.

**126.** (A) 1897
The Epidemic Diseases Act was enacted in 1897 originally to contain a severe bubonic plague epidemic in colonial Bombay. The historical legislation grants emergency administrative powers to government authorities to restrict public movement, mandate isolation, inspect arriving passengers, and enforce public health containment orders during severe health threats.

**127.** (B) The Disaster Management Act, 2005
The Disaster Management Act of 2005 was enacted to establish comprehensive institutional frameworks for disaster response, risk reduction, and emergency preparedness. The Act created the National Disaster Management Authority,

Downloaded from www.pdf.tube

(A) Fructose
(B) Glucose
(C) Amino acids
(D) Potassium

**18.** Antigenic drift in influenza viruses is best described as:
(A) The sudden appearance of a new viral subtype causing a pandemic
(B) The reassortment of genetic segments between human and avian viruses
(C) The complete elimination of viral antigens due to extreme heat
(D) The gradual accumulation of minor point mutations in the viral RNA

**19.** Which diagnostic method is considered the gold standard for confirming Typhoid fever during the first week of illness?
(A) Blood culture
(B) Stool culture
(C) Urine culture
(D) Widal test

**20.** Consider the following statements regarding parasitic diseases:
I. Malaria involves both a human host and a mosquito vector for its complete life cycle.
II. Kala-azar primarily affects the reticuloendothelial system, including the spleen and liver.
III. Filariasis vectors belong entirely to the Anopheles genus.
IV. Plasmodium falciparum causes the most severe form of malaria.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II, III and IV only
(D) I, III and IV only

**21.** Which of the following is NOT typically recognized as a waterborne disease?
(A) Measles
(B) Cholera
(C) Typhoid fever
(D) Giardiasis

**22.** What is the most effective and widely recommended municipal-level preventive measure against the spread of waterborne bacterial diseases?
(A) Boiling all water before consumption
(B) Widespread administration of prophylactic antibiotics
(C) Providing bottled water to the entire population
(D) Chlorination of public water supplies

**23.** Match the airborne diseases with their defining characteristics:
**List I: (Airborne Disease)**
P. Tuberculosis
Q. Influenza
R. Measles
S. Legionnaires' disease
**List II: (Defining Characteristic)**
1. Highly contagious viral disease characterized by Koplik spots
2. Caused by bacteria spreading through aerosolized water systems
3. Chronic bacterial infection leading to caseous necrosis in lungs
4. Acute viral respiratory illness with frequent antigenic changes
Select the correct code:
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

**24.** Which of the following correctly describes droplet transmission as opposed to true airborne transmission?
(A) Droplet transmission involves aerosolized particles under 5 micrometers remaining suspended in air for extended hours.
(B) Droplet transmission occurs exclusively in outdoor atmospheric environments during periods of high ambient humidity.
(C) Droplet transmission occurs when larger respiratory particles settle quickly, typically within 1 to 2 meters.
(D) Droplet transmission relies entirely on indoor mechanical ventilation and air conditioning systems to disperse pathogens.

**25.** Consider the following statements about non-communicable diseases (NCDs):
**Statement I:** NCDs are generally characterized by a rapid onset and short duration.
**Statement II:** NCDs are the leading cause of global mortality, often linked to lifestyle factors.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect

NODIA

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

**137.** (B) Constant presence and usual prevalence of a disease within an area
In classical epidemiological terminology, an endemic disease refers to the constant presence, expected frequency, or usual prevalence of an infectious agent or clinical condition within a given geographic area or population group. Unlike an epidemic, an endemic situation represents a stable baseline disease level maintained without major unexpected disease spikes.

**138.** (B) Right of residents to free emergency treatment without prepayment
A central statutory feature and point of debate during the enactment of the Rajasthan Right to Health Care Act 2022 was granting residents the legal right to free emergency treatment. The law mandates that empanelled public and private hospitals provide immediate emergency treatment without demanding advance payments or delaying care.

**139.** (C) Rs. 10 Lakhs
Under the Mukhyamantri Chiranjeevi Durghatna Bima Yojana in Rajasthan, accidental insurance coverage was established to protect families facing sudden trauma or fatal accidents. In major state budget policy updates, the state government formally increased the maximum financial accidental cover limit from Rupees 5 Lakhs to Rupees 10 Lakhs per eligible beneficiary family.

**140.** (C) 2020
In January 2020, the Revised National Tuberculosis Control Programme was officially renamed as the National Tuberculosis Elimination Programme. This structural renaming reflected a fundamental shift from disease control to disease elimination, aligning national health strategy with the goal of ending tuberculosis in India by 2025, five years ahead of global targets.

www.nodia.in

Click Here to Buy book on Amazon

**50.** Which of the following is considered a direct mode of transmission for a zoonotic disease?
(A) Consuming raw or undercooked meat from an infected animal
(B) Being bitten by a mosquito that previously fed on an infected bird
(C) Drinking water contaminated by animal feces
(D) Being scratched or bitten by an infected animal

**51.** Gestational diabetes specifically refers to:
(A) Diabetes first diagnosed during pregnancy in a woman without prior history of diabetes.
(B) Pre-existing Type 1 diabetes mellitus that acutely worsens due to pregnancy-induced hormonal changes.
(C) A temporary metabolic form of glucose intolerance observed primarily in low-birth-weight premature infants.
(D) Sustained high blood sugar levels resulting directly from hormonal fertility treatments administered prior to conception.

**52.** Which of the following statements differentiating benign from malignant tumors is incorrect?
(A) Benign tumors usually grow slowly, while malignant tumors tend to grow rapidly.
(B) Benign tumors are typically well-encapsulated, whereas malignant tumors invade surrounding tissues.
(C) Benign tumors frequently metastasize to distant organs.
(D) Malignant tumors are more likely to cause significant morbidity and mortality if left untreated.

**53.** Consider the following risk factors for hypertension:
I. High dietary potassium intake
II. Obesity
III. Excessive alcohol consumption
Which of the above statement(s) is/are correct regarding factors that increase the risk of developing hypertension?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**54.** Which of the following diseases is the odd one out because it is NOT a zoonotic disease?
(A) Rabies
(B) Anthrax
(C) Brucellosis
(D) Scurvy

**55.** Insulin helps lower blood glucose levels primarily by:
(A) Promoting the active renal excretion and filtration of excess glucose through the kidneys
(B) Facilitating cellular glucose uptake in muscle and adipose tissues
(C) Stimulating hepatic enzymatic pathways to rapidly break down stored glycogen into free glucose
(D) Inhibiting enzymatic digestion and absorption of dietary carbohydrates within the small intestine

**56.** In the context of cancer genetics, what is a proto-oncogene?
(A) A gene that actively induces apoptosis and programmed cell death in severely damaged or mutated cells
(B) An integrated viral gene that explicitly targets, cleaves, and destroys human chromosomal DNA structures
(C) A normal gene regulating cell growth that becomes an oncogene when mutated
(D) A specialized housekeeping gene exclusively responsible for repairing double-stranded DNA lesions

**57.** The DASH diet is a well-known non-pharmacological intervention. What does it primarily aim to prevent or manage?
(A) Type 1 Diabetes
(B) Skin cancer
(C) Asthma
(D) Hypertension

NODIA

**58.** The term "reverse zoonosis" (or anthroponosis) refers to:
(A) A disease transmitted from humans to vertebrate animals
(B) A disease that affects only animals but mimics human diseases
(C) A disease transmitted by plants to humans
(D) A disease that spontaneously mutates into a non-infectious form

**59.** Arrange the following steps in the typical pathogenesis of Type 2 Diabetes in correct physiological order:
1. Impaired glucose tolerance and elevated fasting glucose

(B) Angiotensin-converting enzyme 2
(C) Nicotinic acetylcholine receptor
(D) Toll-like surface receptor 4

**8.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Malaria is exclusively caused by the bite of a female Anopheles mosquito.
**Reason (R):** The male Anopheles mosquito lacks the specialized mouthparts required to pierce human skin and feed on blood.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**9.** Kala-azar, also known as visceral leishmaniasis, is transmitted by the bite of which vector?
(A) Aedes aegypti mosquito
(B) Culex mosquito
(C) Tsetse fly
(D) Phlebotomus sandfly

**10.** Lymphatic filariasis, which can lead to elephantiasis, is primarily caused by which of the following parasitic worms?
(A) Wuchereria bancrofti
(B) Ascaris lumbricoides
(C) Taenia solium
(D) Plasmodium falciparum

**11.** Which of the following is an example of active immunity?
(A) Transfer of maternal antibodies to the fetus across the placenta
(B) Protection generated after receiving the oral polio vaccine
(C) Administration of anti-rabies immunoglobulin after a dog bite
(D) Injection of snake antivenom

**12.** All of the following are examples of viral diseases EXCEPT:
(A) Influenza
(B) Typhoid
(C) Hepatitis B
(D) COVID-19

**13.** Which of the following statements about direct contact transmission is incorrect?
(A) It involves the transfer of pathogens via contaminated food or water.
(B) It requires physical contact between an infected person and a susceptible person.
(C) Skin-to-skin contact and sexual intercourse are common examples.
(D) Pathogens causing diseases like syphilis and gonorrhea often rely on it.

**14.** Which of the following represents the correct sequence of the general stages of an infectious disease?
(A) Incubation period → Prodromal period → Period of illness → Period of decline → Period of convalescence
(B) Prodromal period → Incubation period → Period of illness → Period of decline → Period of convalescence
(C) Incubation period → Period of illness → Prodromal period → Period of convalescence → Period of decline
(D) Period of illness → Incubation period → Prodromal period → Period of decline → Period of convalescence

**15.** Arrange the following stages of the Plasmodium (Malaria) life cycle in the correct chronological order starting from a mosquito bite:
1. Merozoites infect red blood cells
2. Sporozoites are injected into the human bloodstream
3. Gametocytes are ingested by a feeding mosquito
4. Sporozoites travel to and infect liver cells

Select the correct order:
(A) 2, 4, 1, 3
(B) 2, 1, 4, 3
(C) 4, 2, 1, 3
(D) 2, 3, 4, 1

**16.** In epidemiology, what does the term “fomite” refer to?
(A) A biological vector such as an arthropod that actively transmits pathogens
(B) An animal species serving as a primary reservoir for zoonotic diseases
(C) An inanimate object capable of harboring and transferring pathogens
(D) An asymptomatic human carrier harboring and shedding a disease

**17.** The oral rehydration solution (ORS) used in the treatment of cholera relies on the co-transport of sodium ions with which other molecule in the human intestine?

Downloaded from www.pdf.tube

# CHAPTER 09

# Infectious, Non-Infectious and Zoonotic Diseases

**1.** Which of the following best defines an infectious disease in a biological context?
(A) A disease caused by genetic mutations inherited from parents
(B) A disease caused by pathogenic microorganisms that can be spread directly or indirectly from one person to another
(C) A disease caused strictly by environmental pollutants and lifestyle choices
(D) A disease that develops spontaneously due to metabolic dysfunction

**2.** Consider the following statements regarding the modes of disease transmission:
**Statement I:** Fomite transmission occurs when a susceptible host touches a contaminated inanimate object.
**Statement II:** Vector-borne transmission is a type of direct contact transmission.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**3.** Match the bacterial diseases with their primary causative agents:
**List I: (Bacterial Disease)**
P. Tuberculosis
Q. Cholera
R. Typhoid
S. Diphtheria
**List II: (Causative Agent)**
1. Salmonella enterica
2. Corynebacterium diphtheriae
3. Mycobacterium tuberculosis
4. Vibrio cholerae
Select the correct code:
(A) P-3, Q-4, R-1, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-4, Q-3, R-1, S-2
(D) P-2, Q-4, R-1, S-3

**4.** Which specific diagnostic test is widely used in India to detect latent Mycobacterium tuberculosis infection by measuring immune reactivity?
(A) Widal test
(B) VDRL test
(C) Mantoux tuberculin skin test
(D) ELISA test for NS1 antigen

**5.** The extreme fluid loss in cholera is primarily caused by which mechanism?
(A) Enterotoxin secretion stimulating mucosal hypersecretion of fluid and chloride ions
(B) Direct invasion and destruction of epithelial cells lining the lower intestinal tract
(C) An autoimmune inflammatory response targeting epithelial receptors in the gut lining
(D) Mechanical obstruction of the lower gastrointestinal tract by dense bacterial masses

NODIA

**6.** Consider the following statements regarding Hepatitis:
I. Hepatitis A and E are predominantly transmitted through the fecal-oral route.
II. Hepatitis B is primarily transmitted through contaminated water sources.
III. Hepatitis C is a major cause of chronic liver disease and cirrhosis.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**7.** The SARS-CoV-2 virus, responsible for COVID-19, initiates cell entry by binding specifically to which receptor on human cells?
(A) CD4 surface receptor protein

(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**26.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The prevalence of non-communicable diseases has rapidly increased in urban centers of developing countries.
**Reason (R):** Urbanization is frequently associated with increased sedentary behavior, higher consumption of processed foods, and greater exposure to air pollution.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**27.** The term atherosclerosis, a major underlying cause of heart disease, refers to:
(A) An abnormal and sustained increase in the resting heart rate exceeding normal biological physiological limits
(B) The accumulation of fatty deposits, cholesterol, and cellular waste in artery walls
(C) The localized weakening, dilation, and structural ballooning of a major arterial vessel wall
(D) A severe congenital structural defect resulting in an abnormal opening between adjacent heart chambers

**28.** Consider the following risk factors:
I. Tobacco use
II. High dietary sodium intake
III. Regular aerobic exercise
Which of the above are recognized as modifiable risk factors for cardiovascular diseases?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**29.** Which of the following statements regarding the prevention of cardiovascular disease is incorrect?
(A) Consumption of trans fats increases HDL cholesterol, thereby protecting the heart.
(B) Consistently replacing saturated fats with polyunsaturated fats significantly reduces overall cardiovascular risk.
(C) Engaging in regular moderate-to-vigorous intensity aerobic physical activity is strongly recommended for heart health.
(D) Maintaining optimal resting blood pressure and fasting blood glucose levels substantially reduces heart disease risk.

**30.** Which of the following diseases is the odd one out in terms of its primary mode of transmission?
(A) Hepatitis A
(B) Amoebic dysentery
(C) Tuberculosis
(D) Cholera

**31.** Consider the following preventive measures for airborne diseases:
I. Use of $N_{95}$ respirators
II. Improving indoor ventilation
III. Ultraviolet germicidal irradiation in HVAC systems
IV. Chlorination of drinking water
Which of the above statement(s) is/are correct for preventing airborne transmission?
(A) I, II and IV only
(B) II, III and IV only
(C) I, II and III only
(D) I, III and IV only

**32.** Which pair correctly contrasts a non-communicable disease with a communicable disease?
(A) Tuberculosis - Hypertension
(B) Malaria - Asthma
(C) Diabetes Type 2 - Cholera
(D) Influenza - Dengue

**33.** In the context of coronary heart disease, the term "ischemia" specifically refers to:
(A) The complete structural necrosis and irreversible infarction of functional heart tissue
(B) Inadequate supply of blood and oxygen reaching the working heart muscle
(C) An abnormal, irregular, or erratic electrical conduction rhythm of the heartbeat
(D) Pathological enlargement and hypertrophy of the cardiac chambers secondary to elevated pressure

**34.** The presence of Escherichia coli (E. coli) in a municipal water supply is most specifically an indicator of:
(A) High levels of dissolved heavy metals

Click Here to Buy book on Flipkart

empowered to issue binding national guidelines, mobilize emergency resources, and coordinate multi-sectoral operations during severe health emergencies and biological disasters.

**128.** (A) Human health, animal health, and the environment
The 'One Health' approach is a collaborative, transdisciplinary strategy that recognizes that human health is inextricably linked to animal health and the shared environment. It brings together experts across public health, veterinary medicine, ecology, and environmental science to effectively prevent, detect, and control emerging zoonotic disease outbreaks and growing antimicrobial resistance.

**129.** (A) I, II and III only
Under the International Health Regulations framework, member nations must maintain core public health capacities, including disease surveillance, rapid risk assessment, laboratory diagnostic confirmation, and clear risk communication. The regulations aim to prevent international disease spread while explicitly avoiding unnecessary, disruptive interference with international traffic, global trade, or economic sanctions.

**130.** (A) Verify the diagnosis → Confirm the existence of an outbreak → Define and identify cases → Formulate a hypothesis
Outbreak investigations follow a structured epidemiological protocol. Practitioners first verify the clinical diagnosis using laboratory tests, confirm that observed cases exceed expected baseline levels, establish a standardized case definition to identify cases, and subsequently formulate descriptive epidemiological hypotheses concerning the disease source, transmission mode, and exposure factors.

**131.** (C) 24 weeks
The Medical Termination of Pregnancy Amendment Act 2021 amended statutory reproductive laws in India. It expanded the upper gestational limit for legal abortion from 20 to 24 weeks for special categories of women, including survivors of sexual assault, rape, incest, minors, and women with physical disabilities, subject to medical board authorization.

**132.** (C) Child Sex Ratio
The Pre-Conception and Pre-Natal Diagnostic Techniques Act of 1994 was enacted by Parliament to halt the alarming decline in the Child Sex Ratio caused by female feticide. The legislation strictly prohibits sex selection, bans sex determination using ultrasound or diagnostic techniques, and regulates imaging facilities to prevent gender-biased sex selection.

**133.** (B) Once a month
Village Health Sanitation and Nutrition Day is organized monthly at local Anganwadi centres across rural communities. Functioning as a platform for primary care delivery, VHSND provides antenatal check-ups, infant immunizations, growth monitoring, supplementary nutrition distribution, and health education through the coordinated efforts of ANMs, ASHAs, and Anganwadi Workers.

**134.** (B) Community Health Officer (CHO)
Under the Ayushman Bharat scheme, primary care teams at Health and Wellness Centres operating at Sub-centre levels are led by Community Health Officers, also called Mid-Level Health Providers. CHOs are trained BSc Nursing graduates or Ayurvedic practitioners who deliver comprehensive primary care, manage telemedicine consultations, and supervise ANMs and ASHAs.

**135.** (B) 9th
The Pradhan Mantri Surakshit Matritva Abhiyan was launched by the Ministry of Health and Family Welfare to ensure fixed-day, free, and comprehensive antenatal care. Conducted on the 9th day of every month across designated public health facilities, it guarantees pregnant women specialized clinical examinations, diagnostics, and high-risk pregnancy screening.

NODIA

**136.** (C) Providing 24-hour Emergency Obstetric Care and blood storage
A First Referral Unit is an upgraded healthcare facility, typically a Community Health Centre or Sub-district Hospital, equipped to manage obstetric and neonatal emergencies. To achieve FRU designation, a facility must mandatorily provide 24-hour emergency obstetric care, perform emergency Caesarean operations, offer newborn care, and operate a dedicated blood storage facility.

(D) Type 1 involves autoimmune destruction of beta cells causing absolute insulin deficiency, while Type 2 involves peripheral insulin resistance.

**42.** In the management of diabetes, the $HbA_1c$ test is widely used to measure:
(A) The average blood glucose levels over the past 2 to 3 months
(B) The immediate blood glucose level at the time of drawing blood
(C) The amount of insulin currently circulating in the bloodstream
(D) The presence of glucose in urine over a 24-hour period

**43.** In the context of cancer, what does the term "metastasis" signify?
(A) Spontaneous or treatment-induced regression of a malignant tumor following intensive chemotherapy
(B) The spread of cancer cells from the primary site to distant organs
(C) The histological transformation of a benign solid tumor into a non-malignant fluid-filled cyst
(D) Complete surgical excision and clear-margin removal of a localized primary tumor mass

**44.** Identify the correct pair regarding the classification of cancers:
(A) Carcinoma - Cancer originating in bone or muscle tissue
(B) Leukemia - Cancer of the blood-forming tissues like bone marrow
(C) Sarcoma - Cancer originating in epithelial cells (skin or lining of organs)
(D) Lymphoma - Cancer of the central nervous system

**45.** Essential hypertension is defined as:
(A) High blood pressure with no single identifiable medical cause.
(B) High blood pressure caused directly by an identifiable underlying medical condition, such as chronic kidney disease.
(C) High blood pressure occurring transiently and exclusively during periods of acute psychological stress or physical exertion.
(D) High blood pressure developing as a direct physiological complication of pregnancy and resolving after delivery.

NODIA

**46.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Zoonotic diseases can spread between animals and humans.
**Reason (R):** Zoonotic pathogens are restricted to only bacterial agents and cannot be viruses or parasites.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**47.** Consider the following complications:
I. Retinopathy
II. Neuropathy
III. Nephropathy
IV. Hearing loss
Which of the above are recognized chronic microvascular complications of poorly managed diabetes?
(A) I, II and IV only
(B) I, III and IV only
(C) I, II and III only
(D) II, III and IV only

**48.** Match the known carcinogens with the types of cancer they are most strongly associated with:
**List I: (Carcinogen)**
P. Human Papillomavirus (HPV)
Q. Asbestos
R. Hepatitis B Virus
S. Tobacco smoke
**List II: (Type of Cancer)**
1. Liver cancer
2. Lung cancer
3. Cervical cancer
4. Mesothelioma
Select the correct code:
(A) P-3, Q-1, R-4, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-1, Q-2, R-3, S-4

**49.** According to general clinical guidelines, an adult is considered to have stage 1 hypertension when their resting blood pressure consistently reads:
(A) 110/70 mmHg
(B) 120/80 mmHg
(C) 130-139 / 80-89 mmHg
(D) 180/120 mmHg

(B) Excessive chlorination
(C) Algal blooms
(D) Recent fecal contamination

**35.** Why is airborne transmission of pathogens often considered more difficult to control than droplet transmission?
(A) Airborne particles remain suspended in air currents and travel over longer distances.
(B) Airborne pathogens infect exclusively immunocompromised individuals with impaired cellular immunity.
(C) Airborne pathogens exhibit complete intrinsic resistance against all standard environmental disinfectants.
(D) Droplet-borne pathogens rely strictly upon direct physical contact between individuals for transmission.

**36.** According to the World Health Organization (WHO), which four groups of diseases account for over 80% of all premature non-communicable disease (NCD) deaths?
(A) Cardiovascular diseases, Mental disorders, Cancers, and Neurological diseases
(B) Diabetes, Cancers, Autoimmune disorders, and Chronic kidney diseases
(C) Cardiovascular diseases, Cancers, Respiratory diseases, and Diabetes
(D) Respiratory diseases, Cancers, Liver cirrhosis, and Obesity

**37.** Match the lipid profiles with their cardiovascular impacts:
**List I: (Lipid Profile)**
P. Low-Density Lipoprotein (LDL)
Q. High-Density Lipoprotein (HDL)
R. Triglycerides
S. Total Cholesterol
**List II: (Cardiovascular Impact)**
1. "Good cholesterol", transports cholesterol to the liver
2. High levels increase risk; major component of plaque ("Bad cholesterol")
3. Sum of all circulating cholesterol
4. A type of fat found in blood, high levels linked to heart disease

Select the correct code:
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**38.** Angina pectoris is a clinical symptom associated with heart disease. What is its primary symptom?
(A) Marked peripheral swelling and edema of the lower extremities resulting from fluid retention
(B) Sudden, transient loss of consciousness accompanied by an abrupt drop in systemic blood pressure
(C) Chronic, persistent productive cough accompanied by severe expiratory wheezing
(D) Severe chest pain or pressure frequently radiating toward the left arm or jaw

**39.** Consider the following conditions:
I. High blood pressure
II. High blood sugar
III. Excess body fat around the waist
These conditions, when occurring together, increase the risk of heart disease and diabetes and are collectively termed:
(A) Polycystic Ovary Syndrome
(B) Metabolic Syndrome
(C) Cushing's Syndrome
(D) Down Syndrome

**40.** Select the correct sequence of events leading to a myocardial infarction (heart attack):
(A) Plaque rupture → Artery occlusion → Atherosclerosis → Tissue ischemia → Myocardial necrosis
(B) Atherosclerosis → Plaque rupture → Artery occlusion → Tissue ischemia → Myocardial necrosis
(C) Tissue ischemia → Atherosclerosis → Plaque rupture → Artery occlusion → Myocardial necrosis
(D) Artery occlusion → Atherosclerosis → Tissue ischemia → Plaque rupture → Myocardial necrosis

**41.** The fundamental difference between Type 1 and Type 2 Diabetes Mellitus is that:
(A) Type 1 diabetes is driven primarily by dietary factors and obesity, whereas Type 2 is strictly a non-modifiable hereditary genetic disorder.
(B) Type 1 diabetes is characterized by peripheral tissue insulin resistance, whereas Type 2 involves excessive, unchecked pancreatic insulin secretion.
(C) Type 1 diabetes can be fully cured through structured dietary modifications alone, whereas Type 2 universally requires lifelong exogenous insulin injections.

Downloaded from www.pdf.tube

2. Exhaustion of pancreatic beta cells leading to decreased insulin production
3. Development of cellular insulin resistance
4. Compensatory hyperinsulinemia (increased insulin production)

Select the correct order:
(A) 3, 4, 1, 2
(B) 1, 3, 4, 2
(C) 3, 1, 4, 2
(D) 4, 3, 1, 2

**60.** Select the correct general sequence for the progression of a solid epithelial cancer:
(A) Metaplasia → Hyperplasia → Dysplasia → Carcinoma in situ → Invasive carcinoma
(B) Hyperplasia → Dysplasia → Carcinoma in situ → Invasive carcinoma → Metastasis
(C) Dysplasia → Metaplasia → Invasive carcinoma → Hyperplasia → Carcinoma in situ
(D) Carcinoma in situ → Dysplasia → Hyperplasia → Metastasis → Invasive carcinoma

**61.** Rabies is a fatal viral disease that causes acute encephalitis. To which virus family does the rabies virus belong?
(A) Rhabdoviridae
(B) Flaviviridae
(C) Orthomyxoviridae
(D) Retroviridae

**62.** Which classical clinical symptom is almost exclusively characteristic of the furious form of human rabies?
(A) Progressive jaundice
(B) Severe hemorrhagic dysentery
(C) Hydrophobia
(D) Persistent productive dry cough

**63.** Match the infectious agents with their common names or diseases:

**List I: (Infectious Agent)**
P. H1N1
Q. H5N1
R. Lyssavirus
S. Bacillus anthracis

**List II: (Common Name / Disease)**
1. Rabies
2. Anthrax
3. Swine Flu
4. Avian Influenza (Bird Flu)

Select the correct code:
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-3, Q-4, R-1, S-2

**64.** Swine flu in humans is predominantly associated with which subtype of the Influenza A virus?
(A) H5N1
(B) $H_7N_9$
(C) H1N1
(D) $H_3N_2$

**65.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Anthrax is a serious infectious disease that can affect both animals and humans, often transmitted through contact with infected animal products.
**Reason (R):** The causative agent, Bacillus anthracis, forms highly resilient spores that can survive in the environment for decades.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**66.** Brucellosis is a zoonotic infection commonly transmitted to humans through:
(A) Being bitten directly by an infected domestic dog or wild canine
(B) Inhalation of bacterial endospores suspended in dust from contaminated soil
(C) Vector transmission through the bite of an infected hard-bodied tick
(D) Consuming unpasteurized milk or dairy products from infected livestock

**67.** Which of the following correctly describes passive immunity?
(A) Transfer of pre-formed antibodies providing immediate, temporary protection.
(B) Adaptive immunity actively generated by an individual's own immune system in response to a natural infection.
(C) Long-term immunity developed following the routine administration of a live attenuated viral vaccine.
(D) Immunological protection that confers robust, lifelong memory against subsequent exposure to a specific pathogen.

NODIA

(D) I, III and IV only

**101.** Under the Integrated Disease Surveillance Programme (IDSP) in India, data is collected on 'S', 'P', and 'L' forms. What does the 'P' form stand for?
(A) Presumptive cases reporting format
(B) Standardized patient clinical diagnosis reporting format
(C) State-level public health surveillance reporting format
(D) Hospital pharmacy drug dispensation reporting format

**102.** Which of the following best describes the primary objective of the Integrated Disease Surveillance Programme (IDSP) in India?
(A) To provide comprehensive free clinical treatment and care for all non-communicable lifestyle diseases
(B) To eliminate all vector-borne infectious diseases by issuing strict mandatory universal vaccination protocols
(C) To strictly regulate quality control, manufacturing standards, and retail pricing of pharmaceutical drugs
(D) To rapidly detect and respond to disease outbreaks using decentralized surveillance

**103.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The "One Health" approach is critical for the prevention and control of zoonotic diseases.
**Reason (R):** Zoonotic diseases emerge from the complex interactions between humans, animals, and their shared environment.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**104.** Which of the following is considered a primary driver of disease emergence according to the One Health framework?
(A) Widespread usage of cost-effective generic pharmaceutical medicines in human primary healthcare settings
(B) Global eradication of variola virus leading to the cessation of routine smallpox vaccination programs
(C) Deforestation and agricultural expansion increasing human-wildlife contact
(D) Significant temporary reductions in volume of international commercial air travel and maritime trade

**105.** Rajasthan launched a dedicated policy to manage and provide relief for a specific occupational lung disease prevalent among mineworkers and stone crushers. Name the disease.
(A) Asbestosis
(B) Byssinosis
(C) Anthracosis
(D) Silicosis

**106.** Dengue outbreaks occur frequently in Rajasthan, particularly post-monsoon. The primary vector, Aedes aegypti, is known for:
(A) Daytime biting behavior and breeding in clean, stagnant water
(B) Breeding exclusively in highly polluted, sewage-contaminated stagnant urban drain water
(C) Biting exclusively at night and breeding along the banks of fast-flowing freshwater rivers
(D) Exhibiting extreme physiological sensitivity when exposed to standard broad-spectrum antibiotics

**107.** Scrub Typhus has emerged as a significant public health problem in several districts of Rajasthan. What is the causative agent and vector for this disease?
(A) A viral pathogen transmitted through the bite of infected Aedes mosquitoes
(B) Orientia tsutsugamushi bacteria transmitted by infected larval chigger mites
(C) A protozoan Plasmodium parasite transmitted through the bite of infected female sandflies
(D) Fungal spores transmitted through direct dermal exposure to contaminated agricultural soil

**108.** The IDSP is currently being transitioned and integrated into a more advanced digital platform known as IHIP. What does IHIP stand for?
(A) Indian Health Investigation Protocol
(B) Integrated Health Information Platform
(C) Internal Hospital Infection Programme
(D) International Health Intervention Policy

Click Here to Buy book on Amazon

infected individual actively sheds pathogens and remains contagious to others
(B) Expected secondary cases from one infected person in a susceptible population.
(C) The precise proportion and percentage of a total population that must acquire immunity to eliminate disease transmission
(D) The overall case fatality ratio and proportion of infected individuals who succumb to a specific disease

**76.** Which class of immunoglobulin (antibody) is typically the first to be secreted during the primary immune response to an initial infection?
(A) IgG
(B) IgM
(C) IgA
(D) IgE

**77.** The major global pandemic that occurred in 2009 was caused by a novel strain of which virus?
(A) H1N1 Swine Influenza
(B) H5N1 Avian Influenza
(C) SARS-CoV-1
(D) Ebola virus

**78.** Leptospirosis is a bacterial disease that affects humans and animals. It is most commonly spread through:
(A) The direct vector bite of an infected rodent flea carrying the bacterial organism
(B) Inhalation of fine respiratory aerosol droplets expelled from an infected individual during coughing
(C) Direct contact with environment or food contaminated by urine of infected animals
(D) Ingestion and consumption of raw or insufficiently undercooked infected pork meat

**79.** Arrange the following events of an adaptive immune response in the correct sequence:
1. Proliferation and differentiation of lymphocytes
2. Antigen recognition by specific lymphocytes
3. Elimination of the pathogen
4. Contraction (apoptosis of effector cells) and memory cell formation

Select the correct order:
(A) 2, 1, 3, 4
(B) 1, 2, 3, 4
(C) 2, 3, 1, 4
(D) 3, 2, 1, 4

NODIA

**80.** The first successful vaccine in human history was developed by Edward Jenner to combat which disease?
(A) Polio
(B) Rabies
(C) Smallpox
(D) Tuberculosis

**81.** According to epidemiological definitions, what is the primary difference between an epidemic and a pandemic?
(A) An epidemic is an infectious outbreak caused exclusively by viral pathogens, whereas a pandemic refers specifically to widespread bacterial infections.
(B) An epidemic is a localized sudden outbreak, while a pandemic spreads across multiple countries or continents.
(C) An epidemic describes a localized disease outbreak associated with a high mortality rate, whereas a pandemic spreads widely with low lethality.
(D) An epidemic represents a disease outbreak affecting animal populations, whereas a pandemic is an epidemic strictly affecting human populations.

**82.** In public health terms, a disease that is constantly present at a baseline or expected level within a specific geographic area or population is referred to as:
(A) Outbreak
(B) Epidemic
(C) Sporadic
(D) Endemic

**83.** Consider the following factors contributing to antibiotic resistance:
I. Over-prescription of antibiotics by health workers
II. Patients not finishing the entire antibiotic course
III. Overuse of antibiotics in livestock and fish farming
IV. Poor infection control in hospitals

Which of the above statement(s) is/are correct regarding major causes of antimicrobial resistance (AMR)?
(A) I, II and III only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

**84.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The misuse of antibiotics has accelerated the evolution of antibiotic-resistant bacteria.
**Reason (R):** Antibiotics induce targeted genetic mutations in bacteria, purposefully making them stronger and resistant to drugs.
Which of the following is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**85.** India's National Framework for Malaria Elimination aims to eliminate malaria (achieve zero indigenous cases) throughout the entire country by which year?
(A) 2025
(B) 2027
(C) 2030
(D) 2035

**86.** The core strategy implemented under India's National Tuberculosis Elimination Programme (NTEP) to ensure treatment adherence and cure is known as:
(A) MDT (Multi-Drug Therapy regimen for chronic mycobacterial infections)
(B) PEP (Post-Exposure Prophylaxis for immediate post-contact prevention)
(C) PrEP (Pre-Exposure Prophylaxis for high-risk preventive management)
(D) DOTS (Directly Observed Treatment, Short-course)

**87.** Consider the following statements regarding WHO pandemic phases:
**Statement I:** The WHO declares a Public Health Emergency of International Concern (PHEIC) only when a disease is entirely eradicated.
**Statement II:** A pandemic declaration implies that sustained community-level transmission of a novel pathogen is occurring globally.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**88.** Methicillin-resistant Staphylococcus aureus (MRSA) is frequently cited in discussions of AMR. What is MRSA?
(A) A viral pathogen strain that has acquired complete resistance against standard frontline antiviral drugs
(B) A fungal pathogen species exhibiting systemic immunity against conventional systemic antifungal medications
(C) Staph bacteria resistant to many commonly used beta-lactam antibiotics
(D) A protozoan parasitic strain responsible for causing severe multidrug-resistant forms of malaria

**89.** In vector-borne disease control, what does "source reduction" primarily involve?
(A) Systematically administering protective vaccines across susceptible human populations
(B) Spraying residual chemical insecticides on indoor wall surfaces inside residential houses
(C) Distributing long-lasting insecticide-treated bed nets to at-risk community members
(D) Eliminating vector breeding sites, such as draining stagnant water bodies

**90.** Under the National Tuberculosis Elimination Programme, what is the primary objective of the Nikshay Poshan Yojana?
(A) Providing monthly financial support for the nutritional needs of notified TB patients
(B) Providing comprehensive free molecular diagnostic tests for all registered TB patients
(C) Distributing free first-line antibiotic drug regimens to all suspected pulmonary cases
(D) Constructing new specialized modern TB treatment hospitals across underserved rural areas

**91.** The primary distinction between an "endemic" state and an "outbreak" is that an outbreak is:
(A) Global in geographic scale and spreading rapidly across multiple continents
(B) A sudden rise in case numbers exceeding baseline levels in a localized area
(C) Characterized exclusively by an immediate near hundred percent fatality rate among cases
(D) Caused solely and exclusively by the emergence of a newly discovered microbial

Downloaded from www.pdf.tube

pathogen

**92.** One of the primary mechanisms by which bacteria share antibiotic resistance genes with one another is through the transfer of small, circular DNA molecules called:
(A) Ribosomes
(B) Plasmids
(C) Mitochondria
(D) Lysosomes

**93.** Indoor Residual Spraying (IRS) is a major strategy used for controlling which disease?
(A) Malaria
(B) Cholera
(C) Tuberculosis
(D) Rabies

**94.** Consider the following statements about Tuberculosis management:
I. MDR-TB is defined as resistance to at least isoniazid and rifampicin, the two most powerful anti-TB drugs.
II. Bedaquiline is a newer drug reserved for the treatment of drug-resistant TB.
III. TB primarily affects the lungs but cannot affect other parts of the body.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**95.** The introduction of Gambusia affinis fishes into ponds and water bodies is a method of biological control primarily aimed at mitigating:
(A) Waterborne bacterial gastrointestinal infections such as cholera and dysentery
(B) Parasitic trematode infections such as schistosomiasis transmitted by freshwater snails
(C) Excessive toxic algal blooms caused by agricultural nutrient runoff in stagnant ponds
(D) Mosquito-borne vector diseases such as malaria and dengue fever

**96.** Which of the following is NOT a fundamental criterion used by the WHO when considering the declaration of a pandemic?
(A) The disease is caused by a new or heavily mutated pathogen to which the population has little to no immunity.
(B) The pathogen causes severe illness and significant mortality globally.
(C) The disease must originate exclusively from a laboratory accident.
(D) There is sustained and efficient human-to-human transmission across multiple geographic regions.

**97.** How does the "One Health" approach view the problem of Antimicrobial Resistance (AMR)?
(A) It considers AMR solely as a human clinical medical problem that must be addressed through hospital policies.
(B) It views AMR as an interconnected threat across human, animal, and environmental sectors.
(C) It completely disregards and ignores the role of intensive livestock agricultural practices in driving resistance.
(D) It attributes the rise of resistant pathogens entirely to severe global climate change and environmental warming.

**98.** In India's malaria control framework, API is a crucial metric used to stratify areas for intervention. What does API stand for?
(A) Active Parasite Infection
(B) Average Pathogen Indicator
(C) Area Protection Index
(D) Annual Parasite Incidence

**99.** TrueNat and CBNAAT (Cartridge Based Nucleic Acid Amplification Test) are rapid molecular diagnostic tests heavily utilized in India for the diagnosis of:
(A) Tuberculosis and COVID-19
(B) Human Immunodeficiency Virus (HIV) infection and AIDS
(C) Vector-borne parasitic malaria and viral dengue fever
(D) Acute viral rabies encephalitis

NODIA

**100.** Consider the following strategies for vector-borne disease control:
I. Use of Long-Lasting Insecticidal Nets (LLINs)
II. Larviciding of water bodies
III. Space spraying (fogging) during outbreaks
IV. Prophylactic antibiotic administration to the entire population
Which of the above statement(s) is/are correct regarding standard vector control measures?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only

**68.** The concept of "herd immunity" refers to:
(A) The high genetic mutation rate allowing a viral pathogen to infect an entire herd of domestic animals rapidly.
(B) The innate physiological immunity naturally possessed exclusively by livestock species against zoonotic pathogens.
(C) Indirect protection when a population threshold becomes immune, reducing pathogen spread.
(D) A mandatory public health policy to isolate and quarantine infected individuals into localized livestock herds.

**69.** Consider the following components of the immune system:
I. Skin and mucous membranes
II. T-lymphocytes
III. Macrophages
IV. Antibodies
Which of the above statement(s) is/are correct regarding components that are considered part of the innate (non-specific) immune system?
(A) I and III only
(B) II and IV only
(C) I, II and III only
(D) I, III and IV only

**70.** Consider the following statements regarding acquired immunity:
**Statement I:** B-cells are responsible for humoral immunity by producing antibodies.
**Statement II:** T-cells are involved in cell-mediated immunity and can directly destroy infected cells.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**71.** What is the standard protocol for post-exposure prophylaxis (PEP) in a severe Category III animal bite suspected of rabies?
(A) Thorough immediate wound cleansing with soap and water followed exclusively by a course of broad-spectrum antibiotics
(B) Immediate wound washing with rabies vaccine and Rabies Immunoglobulin (RIG) administration
(C) Immediate surgical closure and suturing of the bite wound accompanied by a tight compressive dressing
(D) Prophylactic administration of a single dose of tetanus toxoid vaccine without rabies vaccination

**72.** Which of the following statements about Avian Influenza (Bird Flu) is incorrect?
(A) Avian influenza viruses naturally circulate worldwide among wild aquatic bird species without causing illness.
(B) Highly pathogenic strains like H5N1 cause severe disease and high mortality rates in domestic poultry populations.
(C) Sustained human-to-human transmission of H5N1 is common and drives global human pandemics.
(D) Human infections occur primarily through direct contact with infected poultry or heavily contaminated farm environments.

**73.** Consider the following forms of Anthrax disease in humans:
I. Cutaneous Anthrax
II. Gastrointestinal Anthrax
III. Inhalation Anthrax
Which of the above statement(s) is/are correct regarding the ways anthrax can present clinically depending on the route of exposure?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**74.** Live attenuated vaccines, such as the Measles, Mumps, and Rubella (MMR) vaccine, are created by:
(A) Weakening the laboratory pathogen so it replicates without causing disease.
(B) Inactivating and killing the pathogenic organism completely using controlled heat or chemical agents like formalin.
(C) Isolating, extracting, and purifying only a specific antigenic protein or subunit fragment from the pathogen.
(D) Utilizing a genetically modified, non-pathogenic viral vector to deliver recombinant genetic material into host cells.

**75.** In epidemiology, what does the basic reproduction number ($R_0$) indicate in the context of herd immunity?
(A) The average duration in days that an

Click Here to Buy book on Flipkart

**109.** In the context of One Health, the term "zoonotic spillover" refers to:
(A) Initial pathogen transmission from a vertebrate animal to a human.
(B) Environmental contamination of deep groundwater tables by untreated agricultural livestock waste
(C) The unintentional, accidental release of a dangerous pathogen from a high-containment research facility
(D) Rapid epidemiological spread of an infectious disease from a dense urban center to a rural village

**110.** Rajasthan, along with the rest of India, successfully eradicated which waterborne parasitic disease that was once highly endemic in the state?
(A) Human malaria
(B) Schistosomiasis
(C) Guinea worm disease
(D) Lymphatic filariasis

**111.** High concentrations of which naturally occurring element in the groundwater of several districts of Rajasthan lead to a non-infectious, chronic crippling disease affecting teeth and bones?
(A) Inorganic Arsenic
(B) Heavy metal Lead
(C) Elemental Mercury
(D) Fluoride

**112.** The Government of Rajasthan operates a major health insurance scheme aimed at providing universal health coverage and reducing out-of-pocket expenditure for both communicable and non-communicable diseases. What is it called?
(A) Ayushman Bharat Pradhan Mantri Jan Arogya Yojana
(B) Bhamashah Swasthya Bima Swavlamban Yojana
(C) Mukhyamantri Chiranjeevi Swasthya Bima Yojana
(D) Rajasthan Universal Jan Arogya Swasthya Yojana

**113.** Under IDSP, "Syndromic Surveillance" involves:
(A) Collecting surveillance data based strictly on definitive, laboratory-confirmed pathogen diagnostic test results
(B) Collecting data based on specific symptoms before a definitive diagnosis is made
(C) Collecting surveillance data based on preliminary clinical diagnoses established by attending medical officers
(D) Monitoring environmental climatic parameters exclusively, such as ambient temperature and seasonal rainfall patterns

**114.** Consider the following statements regarding AMR and One Health:
**Statement I:** The prophylactic use of antibiotics in healthy livestock promotes the development of resistant bacterial strains.
**Statement II:** Resistant strains developed in animals can be transmitted to humans through the food chain or direct contact.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

**115.** While both species are present, which Plasmodium species is responsible for the majority of malaria cases in Rajasthan?
(A) Plasmodium vivax
(B) Plasmodium falciparum
(C) Plasmodium malariae
(D) Plasmodium ovale

**116.** A patient in rural Rajasthan presents with acute fever, headache, and a characteristic dark, scab-like lesion (eschar) on the skin. Which infectious disease is most likely suspected?
(A) Dengue Fever
(B) Malaria
(C) Scrub Typhus
(D) Tuberculosis

**117.** An "outbreak" or local epidemic is officially suspected under IDSP when:
(A) Observed cases exceed expected numbers for a place and time.
(B) A single isolated case of a mild, self-limiting common cold virus is reported within a community
(C) An endemic infectious disease completely disappears and is declared eradicated from an entire geographical region
(D) The overall baseline mortality rate of a chronic non-communicable disease increases slightly over a ten-year decade

Downloaded from www.pdf.tube

**118.** Which of the following is the most effective application of the One Health approach in controlling Rabies?
(A) Directing all public healthcare funding exclusively toward post-exposure prophylaxis treatments for affected human patients
(B) Conducting widespread unselective mass culling of all free-roaming stray dog populations across urban municipalities
(C) Researching and developing novel specialized immunization vaccines meant exclusively for domestic cat populations
(D) Mass dog vaccination combined with human awareness and timely PEP

**119.** Which of the following statements regarding Tuberculosis control in Rajasthan is incorrect?
(A) Mandatory case notification for TB is strictly enforced across both public healthcare centers and private medical providers.
(B) Rajasthan has eliminated TB and has the lowest incidence rate in India.
(C) The health system utilizes rapid molecular diagnostic testing such as CBNAAT to detect drug-resistant TB strains early.
(D) Financial and nutritional support is provided directly to registered TB patients under the Nikshay Poshan Yojana scheme.

**120.** Identify the disease from the following list that is generally considered rare or non-endemic in the dry, arid climate of western Rajasthan compared to the other common endemic diseases:
(A) Vector-borne Plasmodium Malaria
(B) Viral Dengue hemorrhagic fever
(C) Japanese Encephalitis
(D) Mite-borne Scrub Typhus fever

**121.** How is climate change most directly predicted to impact the spread of vector-borne diseases like malaria and dengue?
(A) By directly inducing rapid genetic mutations that convert vector mosquitoes into non-biting herbivorous insects
(B) By increasing atmospheric UV radiation levels to intensely disinfect open water and rapidly destroy mosquito larvae
(C) By directly degrading systemic adaptive immune responses and reducing human natural immunity to vector-borne viruses
(D) By expanding mosquito geographic ranges and lengthening transmission seasons through warming temperatures

**122.** Extreme weather events, such as heavy monsoons and subsequent flooding exacerbated by climate change, most significantly increase the immediate risk of outbreaks of which type of disease?
(A) Waterborne cholera and typhoid
(B) Chronic non-communicable cardiovascular diseases
(C) Highly contagious airborne viral respiratory infections like seasonal influenza
(D) Systemic degenerative autoimmune disorders

**123.** The El Niño-Southern Oscillation (ENSO) is a climate pattern known to influence disease outbreaks. Historically, strong El Niño events have been linked to increased epidemics of which disease in affected tropical regions?
(A) Tuberculosis
(B) Malaria
(C) Rabies
(D) Diabetes

NODIA

**124.** In the study of infectious diseases, the "incubation period" is defined as:
(A) The exact duration during which an infected patient actively sheds pathogens and remains most contagious
(B) The time from pathogen exposure to the appearance of first clinical symptoms.
(C) The time required for the adaptive immune system to produce detectable antibody titers after vaccination
(D) The extended convalescent period during which a patient gradually recovers and heals from the acute illness

**125.** The historical case of "Typhoid Mary" is a classic epidemiological example of:
(A) An asymptomatic bacterial carrier who unknowingly infected others.
(B) A novel zoonotic pathogen spillover event originating from domestic animal reservoirs
(C) The earliest documented historical case of acquired antimicrobial resistance in clinical medicine
(D) A catastrophic clinical failure of an early live attenuated bacterial vaccine candidate

**126.** Which of the following correctly describes the effect of rising environmental temperatures on the lifecycle of a mosquito vector?
(A) Rising environmental temperatures consistently reduce the overall blood-feeding frequency and biting rate of female adult mosquitoes.

(B) Elevated ambient temperatures continuously increase the adult lifespan and survival capacity of the vector mosquito population indefinitely.
(C) Rising temperatures shorten the pathogen extrinsic incubation period in mosquitoes, accelerating transmission.
(D) Excessive environmental heat completely suppresses and halts the physiological reproductive cycle of mosquitoes in affected areas.

**127.** Which ecological consequence of climate change combined with human activity is a major driver for the emergence of new zoonotic diseases like Nipah or Ebola?
(A) Progressive desertification and loss of topsoil across previously fertile agricultural arable land
(B) The systematic expansion and creation of new legally protected marine biodiversity conservation areas
(C) Large-scale urban reforestation and sustainable green infrastructure development municipal projects
(D) Deforestation forcing wildlife, livestock, and humans into close contact

**128.** Pertussis, a highly contagious respiratory tract infection, is characterized by a severe hacking cough. What is its common name?
(A) Lockjaw (Tetanus)
(B) Diphtheria respiratory disease
(C) Whooping cough
(D) Measles (Rubeola)

**129.** Dengue Hemorrhagic Fever (DHF) is a severe, potentially fatal complication of dengue infection. It is more likely to occur when:
(A) An individual contracts a primary infection with any dengue viral strain for the very first time in their life
(B) Subsequent infection occurs with a different dengue viral serotype.
(C) The host simultaneously contracts a co-infection with Plasmodium parasites causing active clinical malaria
(D) The transmitting mosquito vector is co-infected with and transmits both chikungunya virus and dengue virus together

**130.** In the transmission cycle of Leishmaniasis (Kala-azar) in the Indian subcontinent, which entity acts as the primary reservoir for the parasite?
(A) Domestic and stray canines
(B) Wild and peridomestic rodents
(C) Domestic livestock and cattle
(D) Infected humans

**131.** Which of the following statements regarding the impact of climate change on cholera is most accurate?
(A) Warmer sea temperatures and algal blooms favor Vibrio cholerae proliferation.
(B) Pathogenic Vibrio cholerae bacteria are extremely sensitive to heat and cannot survive in warmer coastal waters.
(C) Extended drought conditions represent the single, exclusive atmospheric climate driver responsible for cholera outbreaks.
(D) Global climate change and associated environmental shifts have permanently eradicated cholera from all endemic tropical regions.

**132.** While both are critical cardiovascular emergencies, a stroke primarily differs from a heart attack in that:
(A) A stroke is caused primarily by an acute viral infection, whereas a heart attack is entirely related to chronic lifestyle habits.
(B) A stroke occurs exclusively as a neurological complication in patients diagnosed with long-standing, poorly controlled Type 1 Diabetes.
(C) A stroke affects blood supply to the brain, whereas a heart attack affects blood supply to the heart muscle.
(D) A stroke is universally characterized by a rapid and dangerously low systemic drop in resting blood pressure levels.

**133.** The classical triad of symptoms for undiagnosed or poorly managed diabetes mellitus includes polyuria, polydipsia, and:
(A) Polyphagia
(B) Polycythemia
(C) Polymyalgia
(D) Polyneuropathy

**134.** The Pap smear (Papanicolaou test) is a widely used secondary prevention screening tool aimed at the early detection of which type of cancer?
(A) Breast cancer
(B) Ovarian cancer
(C) Endometrial cancer
(D) Cervical cancer

Click Here to Buy book on Amazon

**135.** Which medical instrument is standardly used for the clinical measurement of blood pressure to diagnose hypertension?
(A) Electrocardiogram
(B) Sphygmomanometer
(C) Pulse oximeter
(D) Spirometer

**136.** The Nipah virus, a zoonotic pathogen that causes severe respiratory and neurological disease, has which animal as its natural reservoir host?
(A) Domestic swine (pigs)
(B) Wild forest boars
(C) Fruit bats
(D) Macaque primates

**137.** The natural transfer of maternal IgG antibodies to a fetus across the placenta is a vital evolutionary mechanism that provides the newborn with:
(A) Natural active immunity
(B) Artificial active immunity
(C) Artificial passive immunity
(D) Natural passive immunity

**138.** In epidemiological outbreak investigations, a "point-source epidemic" curve is typically characterized by:
(A) A rapid rise to a single peak followed by a gradual decline after simultaneous common exposure.
(B) Multiple irregular, recurrent wave-like epidemic peaks over extended periods of time, strongly indicating continuous person-to-person disease spread
(C) A completely flat horizontal baseline trend line indicating steady, constant endemic disease transmission within a stable population
(D) A slow, gradual prolonged rise in reported case counts that eventually plateaus and persists unchanged for several consecutive years

**139.** Which agricultural practice is most heavily criticized by the WHO for driving antimicrobial resistance?
(A) The widespread commercial cultivation and release of genetically modified agricultural crop varieties
(B) Routine growth-promotional use of medically important antibiotics in healthy food animals
(C) The intensive, unregulated application of synthetic chemical fertilizers and pesticides to soil
(D) The traditional agricultural practice of seasonal crop rotation across arable farming lands

**140.** As global warming causes the melting of permafrost in Arctic and sub-Arctic regions, what specific, novel infectious disease threat is most feared by microbiologists?
(A) The rapid evolutionary emergence and geographical spread of entirely new species of vector mosquitoes
(B) The release and reactivation of ancient viable pathogens frozen in permafrost
(C) The unexpected spontaneous biological generation and propagation of infectious prions in thawing tundra soil
(D) A dramatic, uncontrolled increase in atmospheric ozone-depleting bacterial populations released from ice

www.nodia.in

NODIA

# ANSWERS

**1.** (B) A disease caused by pathogenic microorganisms that can be spread directly or indirectly from one person to another
In biological and medical science, an infectious disease is characterized by its etiology involving biological agents known as pathogens. These microscopic organisms include bacteria, viruses, fungi, and parasites. They invade host tissues, multiply, and disrupt normal physiological functions, frequently transmitting between individuals through direct contact, airborne droplets, vectors, or contaminated environmental vehicles.

**2.** (C) Statement I is correct but Statement II is incorrect
Fomite transmission involves indirect contact where susceptible individuals touch inanimate objects contaminated with infectious agents. In contrast, vector-borne transmission relies on living organisms, such as mosquitoes or ticks, to transfer pathogens between hosts. Because vector transmission involves an intermediate living host rather than physical contact between human individuals, it is classified as indirect rather than direct transmission.

**3.** (A) P-3, Q-4, R-1, S-2
Tuberculosis is caused by the bacterium Mycobacterium tuberculosis, primarily affecting lung tissues. Cholera is an acute intestinal infection resulting from Vibrio cholerae. Typhoid fever is caused by Salmonella enterica serovar Typhi through contaminated food or water. Diphtheria is driven by Corynebacterium diphtheriae, which produces toxins causing upper respiratory tract membrane inflammation and systemic complications.

**4.** (C) Mantoux tuberculin skin test
The Mantoux tuberculin skin test measures delayed-type hypersensitivity cell-mediated immune responses against purified protein derivative extracted from Mycobacterium tuberculosis. Standardized administration involves intradermal injection into the inner forearm surface. The size of the resulting induration is evaluated after forty-eight to seventy-two hours, serving as a primary diagnostic tool to identify latent tuberculosis infection in clinical settings.

**5.** (A) Enterotoxin secretion stimulating mucosal hypersecretion of fluid and chloride ions
Vibrio cholerae colonizes the small intestine and secretes cholera toxin, an enterotoxin that binds to mucosal epithelial cells. This toxin persistently activates intracellular adenylate cyclase, raising cyclic adenosine monophosphate levels. Consequently, active secretion of chloride ions into the intestinal lumen increases dramatically, drawing massive amounts of water and electrolytes, leading to rapid, severe, watery diarrhea.

**6.** (B) I and III only
Hepatitis A and E viruses are transmitted via the fecal-oral route through ingestion of contaminated water or food. Hepatitis B is transmitted through exposure to infectious blood, blood products, or bodily fluids, rather than contaminated water. Hepatitis C is an bloodborne virus that frequently causes chronic infection, leading to progressive hepatic fibrosis, liver cirrhosis, and hepatocellular carcinoma.

**7.** (B) Angiotensin-converting enzyme 2
The severe acute respiratory syndrome coronavirus 2 utilizes its surface spike glycoprotein to facilitate viral entry into host cells. The receptor-binding domain of the spike protein attaches specifically to human angiotensin-converting enzyme 2 receptors present on cell membranes. Host transmembrane serine proteases then cleave the viral protein, allowing membrane fusion and viral genome entry into pulmonary tissues.

**8.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Female Anopheles mosquitoes require blood meals to obtain essential nutrients and proteins necessary for egg development. Male mosquitoes feed exclusively on plant nectar and fruit juices because their mouthparts lack the specialized piercing structures required to penetrate human skin. Consequently, female Anopheles mosquitoes serve as the exclusive biological

Downloaded from www.pdf.tube

vectors responsible for transmitting Plasmodium parasites to humans.

**9.** (D) Phlebotomus sandfly
Visceral leishmaniasis, commonly known as Kala-azar, is a systemic protozoan disease caused by parasites of the Leishmania donovani complex. Transmission to humans occurs through the bite of infected female phlebotomine sandflies belonging to the genus Phlebotomus. These tiny insects pick up flagellated promastigotes during blood meals and inject them into susceptible mammalian hosts during subsequent feedings.

**10.** (A) Wuchereria bancrofti
Lymphatic filariasis is a parasitic infection predominantly caused by the filarial nematode Wuchereria bancrofti. Transmitted through mosquito bites, the microscopic larvae travel to lymphatic vessels where they mature into adult worms. The chronic presence of adult parasites causes lymphatic dysfunction, inflammation, and vessel blockage, leading to severe lymphedema, tissue swelling, and the debilitating clinical condition known as elephantiasis.

**11.** (B) Protection generated after receiving the oral polio vaccine
Active immunity develops when an individual's own immune system responds to an antigen by mounting a specific cellular and humoral response, producing long-lasting memory cells. The oral polio vaccine introduces attenuated poliovirus strains, triggering active antibody generation without causing severe disease. In contrast, transferring pre-formed maternal antibodies or administering immunoglobulins represents passive immunity, conferring immediate but temporary protection.

**12.** (B) Typhoid
Typhoid fever is a systemic bacterial infection caused by Salmonella enterica serovar Typhi, acquired through ingestion of fecally contaminated food or drinking water. Conversely, influenza is caused by influenza viruses, Hepatitis B is caused by an enveloped DNA virus, and COVID-19 is caused by severe acute respiratory syndrome coronavirus 2, making typhoid distinct as a bacterial pathogen.

NODIA

**13.** (A) It involves the transfer of pathogens via contaminated food or water.
Direct contact transmission strictly requires physical contact between an infected person and a susceptible individual, such as touching, kissing, or sexual intercourse. Diseases like syphilis and gonorrhea rely on this mechanism. Transferring pathogens through vehicle vehicles like contaminated food, water, or inanimate objects represents indirect contact or vehicle transmission, rather than direct contact transmission between individuals.

**14.** (A) Incubation period → Prodromal period → Period of illness → Period of decline → Period of convalescence
Infectious disease progression follows five sequential phases. The incubation period occurs after initial pathogen entry before symptoms appear. The prodromal period exhibits early non-specific mild symptoms. The period of illness presents peak characteristic disease signs. The period of decline involves diminishing symptoms as host defenses control infection. Finally, the period of convalescence marks systemic recovery and physiological repair.

**15.** (A) 2, 4, 1, 3
During a bite, an infected mosquito injects sporozoites into the human bloodstream. These sporozoites migrate rapidly to the liver, invading hepatocytes to undergo asexual multiplication. Released hepatic merozoites then invade red blood cells, initiating the symptomatic erythrocytic cycle. Eventually, some merozoites differentiate into sexual gametocytes, which are ingested by another feeding mosquito, completing the cycle.

**16.** (C) An inanimate object capable of harboring and transferring pathogens
In epidemiological science, a fomite is defined as any non-living, inanimate object or surface that can become contaminated with infectious microorganisms. Examples include doorknobs, medical instruments, bedding, clothing, and eating utensils. When a susceptible person touches a contaminated fomite and subsequently touches their eyes, nose, or mouth, pathogens are transferred, causing indirect contact transmission.

**17.** (B) Glucose
Oral rehydration solution therapy utilizes the intact intestinal sodium-glucose cotransporter

protein system located in the brush border membrane of enterocytes. Concurrent transport of sodium ions and glucose molecules creates an osmotic gradient that drives rapid passive absorption of water and essential electrolytes across the intestinal mucosal membrane, counteracting severe fluid loss caused by cholera enterotoxin hypersecretion.

**18.** (D) The gradual accumulation of minor point mutations in the viral RNA
Antigenic drift refers to the ongoing accumulation of small point mutations within the genes encoding surface glycoproteins, specifically hemagglutinin and neuraminidase, of influenza viruses. These subtle genetic alterations occur during viral RNA replication due to error-prone viral polymerase activity. Over time, antigenic drift produces new viral strains that evade pre-existing host antibodies, requiring annual vaccine updates.

**19.** (A) Blood culture
During the first week of typhoid fever, Salmonella enterica serovar Typhi bacteremia peaks as bacteria multiply within the bloodstream. Consequently, blood culture is the diagnostic gold standard, offering high sensitivity and specificity for definitive isolation. Serological tests like the Widal test and stool or urine cultures become informative primarily in subsequent weeks of untreated clinical illness.

**20.** (A) I, II and IV only
Malaria requires humans and Anopheles mosquitoes to complete its lifecycle, and Plasmodium falciparum causes the most severe, life-threatening clinical disease. Kala-azar affects reticuloendothelial structures including liver and spleen. However, lymphatic filariasis vectors belong to multiple mosquito genera, including Culex, Aedes, and Mansonia in addition to Anopheles, making statements I, II, and IV correct.

**21.** (A) Measles
Measles is a highly contagious viral illness transmitted strictly through airborne respiratory droplets expelled when infected individuals cough or sneeze. In contrast, cholera, typhoid fever, and giardiasis represent classic waterborne diseases transmitted via the fecal-oral route through ingestion of water contaminated with pathogenic bacteria or protozoan cysts, making measles distinctly non-waterborne.

**22.** (D) Chlorination of public water supplies
Municipal water chlorination is widely recognized as the most effective, scalable, and economical public health intervention for eradicating waterborne pathogens. Chlorine disrupts bacterial cell membranes, oxidizes vital enzymes, and leaves persistent residual disinfectant levels throughout distribution networks. This prevents recontamination and effectively neutralizes bacterial agents responsible for devastating waterborne outbreaks like cholera, typhoid, and dysentery.

**23.** (B) P-3, Q-4, R-1, S-2
Tuberculosis is a pulmonary bacterial infection characterized by caseous granulomatous necrosis. Influenza is an acute viral respiratory infection undergoing frequent antigenic mutations. Measles presents pathognomonic Koplik spots on buccal mucosa. Legionnaires' disease is caused by Legionella pneumophila bacteria transmitted via aerosolized water from cooling towers or complex plumbing systems, matching code P-3, Q-4, R-1, S-2.

**24.** (C) Droplet transmission occurs when larger respiratory particles settle quickly, typically within 1 to 2 meters.
Droplet transmission involves large respiratory particles, typically greater than five to ten micrometers in diameter, expelled during coughing or sneezing. Due to gravitational forces, these heavy droplets travel short distances, usually settling within one to two meters onto environmental surfaces or mucosal membranes. True airborne transmission involves tiny aerosol nuclei that remain suspended in air currents for extended periods.

**25.** (D) Statement I is incorrect but Statement II is correct
Non-communicable diseases are defined by slow progression, long duration, and non-infectious etiology, contradicting assertions of rapid onset and short duration. Globally, non-communicable diseases represent the leading cause of mortality, responsible for millions of deaths annually. Major underlying risk drivers include lifestyle factors such as tobacco use, physical inactivity, unhealthy diets, and harmful alcohol consumption.

Click Here to Buy book on Flipkart

undergo clonal proliferation and differentiation into functional effector lymphocytes. These effector cells clear the pathogen through targeted immune actions. Following clearance, contraction occurs as excess effector cells undergo apoptosis, while long-lived memory cells persist for future protection.

**80.** (C) Smallpox
Edward Jenner developed the world's first successful vaccine in 1796 to protect against smallpox. Observing that milkmaids exposed to cowpox were protected from smallpox, Jenner inoculated a young boy with cowpox material and subsequently demonstrated immunity against variola virus exposure, establishing the field of vaccinology and enabling smallpox eradication.

**81.** (B) An epidemic is a localized sudden outbreak, while a pandemic spreads across multiple countries or continents.
In public health epidemiology, an epidemic is defined as a sudden, unexpected increase in disease cases above normal baseline levels within a specific localized community or geographic region. A pandemic occurs when an epidemic disease spreads across international borders, affecting multiple countries, continents, or the entire globe, typically involving widespread population exposure.

**82.** (D) Endemic
In epidemiology, a disease is classified as endemic when it maintains a constant, predictable presence and baseline incidence within a defined geographic region or human population group over extended periods without external inputs. Transmission dynamics remain balanced so that cases recur at predictable rates without escalating into uncontrolled explosive outbreaks.

**83.** (D) I, II, III and IV
Antimicrobial resistance is accelerated by selective pressures across human health and agricultural settings. Prescribing antibiotics unnecessarily for viral infections, premature treatment discontinuation, widespread sub-therapeutic antibiotic administration in farming and aquaculture, and inadequate hygiene practices in clinical environments drive the selection, survival, and spread of resistant bacterial strains globally.

**84.** (C) Assertion (A) is true but Reason (R) is false.
Antibiotic misuse creates strong selective environmental pressure that eliminates susceptible bacteria while allowing naturally resistant mutants or strain variants possessing resistance genes to survive and proliferate. Antibiotics do not intentionally direct biological mutations within bacterial DNA. Therefore, the assertion regarding antibiotic-driven resistance evolution is correct, but the proposed genetic mechanism is incorrect.

NODIA

**85.** (C) 2030
India launched the National Framework for Malaria Elimination to eliminate malaria transmission across all districts. Aligning with global technical strategies, the framework establishes progressive targets to reduce vector-borne parasite incidence, stop local indigenous transmission, and achieve official WHO malaria elimination certification throughout India by the year 2030 through coordinated control interventions.

**86.** (D) DOTS (Directly Observed Treatment, Short-course)
Directly Observed Treatment, Short-course is the cornerstone public health strategy adopted by India's National Tuberculosis Elimination Programme. It ensures treatment adherence and prevents drug resistance by requiring a trained healthcare provider or community worker to directly observe patients swallowing every prescribed dose of anti-tuberculosis medication, ensuring standardized case management and high cure rates.

**87.** (D) Statement I is incorrect but Statement II is correct
A Public Health Emergency of International Concern is declared by WHO during an extraordinary public health event that constitutes a serious, unexpected disease risk requiring coordinated international response, rather than when a disease is eradicated. Conversely, declaring a pandemic indicates that sustained community-level transmission of a novel pathogen is occurring globally across regions.

**88.** (C) Staph bacteria resistant to many commonly used beta-lactam antibiotics
Methicillin-resistant Staphylococcus aureus refers to pathogenic bacterial strains of

**35.** (A) Airborne particles remain suspended in air currents and travel over longer distances.
Airborne transmission involves tiny respiratory droplet nuclei, under five micrometers in diameter, that evaporate and remain suspended in air currents for prolonged periods. These micro-particles travel long distances through indoor ventilation systems. Controlling airborne transmission requires specialized negative-pressure rooms, high-efficiency filtration, or ultraviolet irradiation, whereas droplet transmission requires simple physical distance and basic masks.

**36.** (C) Cardiovascular diseases, Cancers, Respiratory diseases, and Diabetes
According to global public health statistics, four major non-communicable disease categories account for over eighty percent of all premature non-communicable deaths. These four key disease groups are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes mellitus. They share common modifiable risk factors including tobacco consumption, physical inactivity, unhealthy dietary patterns, and excessive alcohol use.

**37.** (A) P-2, Q-1, R-4, S-3
Low-density lipoprotein deposits cholesterol into vascular arterial walls, forming atherogenic plaques. High-density lipoprotein transports cholesterol away from tissues back to the liver for clearance. Triglycerides represent circulating blood fats stored in adipose tissue. Total cholesterol measures all circulating cholesterol fractions combined. These physiological roles establish the correct matching code P-2, Q-1, R-4, S-3.

**38.** (D) Severe chest pain or pressure frequently radiating toward the left arm or jaw
Angina pectoris is the classic clinical manifestation of transient myocardial ischemia. It presents as severe retrosternal chest discomfort, tightness, or squeezing pressure. This ischemic pain frequently radiates to the left shoulder, left arm, neck, or lower jaw. It typically occurs during physical exertion or emotional stress when myocardial oxygen demand exceeds available coronary blood supply.

**39.** (B) Metabolic Syndrome
Metabolic syndrome comprises a cluster of interconnected physiological risk factors occurring together in an individual. These include central abdominal obesity, elevated resting blood pressure, elevated fasting plasma glucose levels, high serum triglycerides, and low high-density lipoprotein cholesterol. This metabolic constellation dramatically increases individual risk for developing cardiovascular arterial disease, ischemic stroke, and type 2 diabetes.

**40.** (B) Atherosclerosis → Plaque rupture → Artery occlusion → Tissue ischemia → Myocardial necrosis
Myocardial infarction begins with chronic arterial atherosclerosis. An unstable atherosclerotic plaque ruptures, exposing subendothelial collagen and triggering immediate platelet aggregation and thrombus formation. This thrombus causes complete artery occlusion, depriving downstream cardiac tissue of oxygenated blood. Prolonged tissue ischemia leads to cell death and permanent myocardial tissue necrosis, representing a classic heart attack.

**41.** (D) Type 1 involves autoimmune destruction of beta cells causing absolute insulin deficiency, while Type 2 involves peripheral insulin resistance.
Type 1 diabetes is an autoimmune disease where host immune responses target and destroy insulin-producing pancreatic beta cells, causing complete insulin deficiency requiring lifelong hormone replacement. Type 2 diabetes is characterized by peripheral tissue insulin resistance combined with progressive compensatory beta cell failure, frequently associated with metabolic syndrome, obesity, physical inactivity, and polygenic genetic predisposition.

NODIA

**42.** (A) The average blood glucose levels over the past 2 to 3 months
The glycated hemoglobin $A_1c$ test quantifies the percentage of hemoglobin molecules bound to glucose in circulating red blood cells. Because erythrocyte lifespan averages approximately 120 days, the glycated fraction reflects weighted average blood glucose concentration over the preceding eight to twelve weeks, providing a reliable diagnostic index for long-term glycemic control.

**26.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Rapid urban growth in developing nations has altered human environments and daily habits. Urbanization promotes sedentary office work, reliance on motorized transport, processed food accessibility, and heightened ambient air pollution exposure. These structural lifestyle shifts directly drive metabolic risk factors, causing a sharp rise in non-communicable diseases such as cardiovascular disease, hypertension, and type 2 diabetes.

**27.** (B) The accumulation of fatty deposits, cholesterol, and cellular waste in artery walls
Atherosclerosis is a progressive chronic inflammatory disorder characterized by the gradual accumulation of lipids, cholesterol, fibrous tissue, and cellular debris within the intimal layer of large and medium-sized arteries. These arterial plaques narrow vessel lumens, restrict blood flow, impair vascular elasticity, and predispose individuals to catastrophic ischemic events such as myocardial infarction and stroke.

**28.** (A) I and II only
Modifiable risk factors are environmental, behavioral, or physiological conditions that individuals can alter to lower disease probability. Tobacco use damages endothelial linings, promoting arterial plaque formation, while high sodium consumption raises systemic blood pressure. Regular aerobic exercise is a protective lifestyle behavior that strengthens cardiovascular health rather than a risk factor, making items I and II correct.

**29.** (A) Consumption of trans fats increases HDL cholesterol, thereby protecting the heart.
Industrial trans fatty acids exert highly deleterious cardiovascular effects by significantly elevating atherogenic low-density lipoprotein cholesterol while simultaneously depressing protective high-density lipoprotein cholesterol levels. This lipid profile disturbance accelerates arterial plaque development and markedly increases coronary heart disease risk, rendering claims that trans fats increase high-density lipoprotein cholesterol and protect heart health completely false.

**30.** (C) Tuberculosis
Hepatitis A, amoebic dysentery, and cholera are enteric pathogens transmitted primarily via the fecal-oral route through ingestion of contaminated drinking water or food supplies. In contrast, tuberculosis is a respiratory bacterial disease transmitted through tiny airborne droplet nuclei suspended in air, making tuberculosis distinct from the other waterborne and foodborne infections listed.

**31.** (C) I, II and III only
Preventing airborne pathogen transmission requires interventions targeting respiratory particles and air circulation. $N_95$ respirators filter airborne droplet nuclei, adequate indoor ventilation dilutes viral concentration, and ultraviolet germicidal irradiation inactivates suspended airborne pathogens within ventilation systems. Chlorination of drinking water is a sanitation measure specifically designed to kill waterborne bacterial pathogens, not airborne organisms.

**32.** (C) Diabetes Type 2 - Cholera
Type 2 diabetes mellitus is a chronic non-communicable metabolic disorder driven by insulin resistance and lifestyle factors, incapable of spreading between individuals. Cholera is an acute, highly communicable bacterial infection caused by Vibrio cholerae and spread through contaminated water. This pair correctly contrasts a non-communicable disease with a communicable infectious disease, matching the specified criteria.

**33.** (B) Inadequate supply of blood and oxygen reaching the working heart muscle
In cardiovascular physiology, ischemia refers specifically to an imbalance between myocardial oxygen supply and demand caused by inadequate coronary arterial blood flow. Frequently resulting from atherosclerotic vessel narrowing or arterial spasm, ischemia deprives cardiac tissue of oxygen and glucose while accumulating metabolic waste, triggering typical symptoms such as chest pain without immediate permanent necrosis.

**34.** (D) Recent fecal contamination
Escherichia coli is a coliform bacterium naturally inhabiting the gastrointestinal tract of warm-blooded mammals. Because E. coli does not multiply significantly in human municipal water environments, its isolated presence in drinking water serves as a highly specific indicator of recent fecal contamination, signaling potential co-existence of dangerous enteric pathogens such as Salmonella, Shigella, or Vibrio.

Downloaded from www.pdf.tube

**52.** (C) Benign tumors frequently metastasize to distant organs.
Benign neoplasms are localized tissue growths that usually grow slowly, remain encapsulated, and do not invade adjacent normal tissue margins or spread to distant anatomical sites. Metastasis is an exclusive physiological property of malignant neoplasms. Therefore, claiming that benign tumors frequently metastasize represents an incorrect statement regarding neoplastic tumor behavior and diagnostic classification.

**53.** (B) II and III only
Obesity increases vascular resistance and blood volume, while excessive alcohol consumption alters vascular tone and activates the sympathetic nervous system, increasing hypertension risk. Conversely, high dietary potassium promotes renal sodium excretion and relaxes blood vessel walls, reducing blood pressure. Thus, only obesity and excessive alcohol intake represent factors that increase hypertension risk.

**54.** (D) Scurvy
Rabies, anthrax, and brucellosis are classic infectious zoonotic diseases transmitted to humans from infected animals. Scurvy is a non-infectious nutritional deficiency disorder caused by prolonged dietary lack of vitamin C (ascorbic acid), necessary for proper collagen synthesis. Because scurvy lacks any microbial cause or animal vector, it stands apart from the listed zoonotic infections.

**55.** (B) Facilitating cellular glucose uptake in muscle and adipose tissues
Pancreatic beta cells secrete insulin in response to elevated blood glucose. Insulin binds to specific cell membrane receptors on skeletal muscle and adipose tissue cells, initiating an intracellular signaling cascade. This triggers translocation of GLUT4 glucose transporter vesicles to the cell surface, facilitating rapid glucose influx into host cells and lowering blood glucose concentration.

**56.** (C) A normal gene regulating cell growth that becomes an oncogene when mutated
Proto-oncogenes are normal, unmutated cellular genes encoding proteins that regulate cell proliferation, differentiation, and survival signaling pathways. When a proto-oncogene undergoes activating gain-of-function point mutations, gene amplification, or chromosomal translocations, it converts into an oncogene, driving uncontrolled cellular growth, hyperproliferation, and malignant transformation within human tissues.

**57.** (D) Hypertension
The Dietary Approaches to Stop Hypertension diet is an evidence-based nutritional intervention specifically designed to lower blood pressure. It emphasizes high consumption of fruits, vegetables, whole grains, and low-fat dairy products rich in potassium, calcium, and magnesium, while restricting dietary sodium, saturated fats, and added sugars, significantly reducing overall cardiovascular risk.

**58.** (A) A disease transmitted from humans to vertebrate animals
Reverse zoonosis, also term anthroponosis, refers to the natural transmission of human pathogens from infected humans to non-human vertebrate animal hosts. Human influenza viruses, Mycobacterium tuberculosis, and SARS-CoV-2 can infect domestic pets, livestock, or captive wildlife, creating secondary animal reservoirs and highlighting the bidirectional biological interface between human and animal populations.

NODIA

**59.** (A) 3, 4, 1, 2
Type 2 diabetes pathogenesis begins with peripheral insulin resistance in skeletal muscle and adipose tissues. In response, pancreatic beta cells increase insulin secretion, causing compensatory hyperinsulinemia. Over time, hyperinsulinemia fails to fully clear circulating glucose, producing impaired glucose tolerance. Eventually, chronic secretory demand causes beta cell exhaustion and dysfunction, resulting in overt clinical diabetes.

**60.** (B) Hyperplasia → Dysplasia → Carcinoma in situ → Invasive carcinoma → Metastasis
Solid epithelial cancer progression starts with hyperplasia, an abnormal increase in cellular density. Cells develop structural atypia and loss of architecture, progressing to dysplasia. Dysplastic changes spanning full epithelial thickness without basement membrane breach represent carcinoma in situ. Basement membrane invasion defines invasive carcinoma, which ultimately metastasizes to distant organs via systemic circulation.

**43.** (B) The spread of cancer cells from the primary site to distant organs
Metastasis is the hallmark biological process by which malignant tumor cells detach from the primary site, invade surrounding extracellular matrices, enter circulatory or lymphatic vessels, travel through systemic circulation, extravasate into distant tissue parenchyma, and colonize secondary organs to form secondary tumor masses, representing the principal cause of cancer mortality.

**44.** (B) Leukemia - Cancer of the blood-forming tissues like bone marrow
Leukemia represents a broad group of hematologic malignancies originating in blood-forming tissues of the bone marrow, characterized by rapid proliferation of abnormal leukocytes. Carcinomas arise from epithelial tissues, whereas sarcomas originate in mesenchymal tissues such as bone, cartilage, or muscle. Lymphomas arise within lymphatic system structures, validating the classification pairing leukemia with bone marrow.

**45.** (A) High blood pressure with no single identifiable medical cause.
Essential or primary hypertension accounts for roughly ninety to ninety-five percent of all clinical high blood pressure cases. It is defined as sustained elevation of systemic arterial blood pressure without a single identifiable secondary medical cause, arising instead from complex interactions between genetic factors, renal sodium excretion, sympathetic nervous system activity, and lifestyle influences.

**46.** (C) Assertion (A) is true but Reason (R) is false.
Zoonotic diseases naturally transmit between vertebrate animals and humans under natural conditions. However, zoonotic pathogens encompass a diverse spectrum of infectious agents, including viruses like rabies and Nipah, parasites like Toxoplasma, and fungi, in addition to bacteria like Brucella and Bacillus anthracis. Because zoonotic agents extend far beyond bacteria, the stated reasoning is incorrect.

**47.** (C) I, II and III only
Chronic hyperglycemia damages small blood vessels throughout the body, leading to characteristic diabetic microvascular complications. Retinopathy impairs retinal capillaries causing vision loss, nephropathy damages renal glomeruli resulting in kidney failure, and neuropathy damages vasa nervorum leading to nerve dysfunction. Hearing loss is not classified as a classic diabetic microvascular disease, making items I, II, and III correct.

**48.** (C) P-3, Q-4, R-1, S-2
Oncogenic human papillomavirus integration drives cervical carcinogenesis. Inhaled asbestos fibers cause malignant pleural mesothelioma. Chronic Hepatitis B viral infection causes hepatic inflammation leading to hepatocellular carcinoma. Tobacco smoke contains abundant polycyclic aromatic hydrocarbons causing pulmonary genetic mutations and lung cancer, establishing the correct matching code P-3, Q-4, R-1, S-2.

**49.** (C) 130-139 / 80-89 mmHg
Standard clinical guidelines classify adult blood pressure into distinct physiological categories. Normal blood pressure is defined as systolic below 120 mmHg and diastolic below 80 mmHg. Stage 1 hypertension is diagnosed when persistent resting measurements range between 130 to 139 mmHg systolic or 80 to 89 mmHg diastolic, guiding clinical lifestyle modifications and therapeutic options.

**50.** (D) Being scratched or bitten by an infected animal
Direct zoonotic transmission requires direct physical contact between an infected animal host and a susceptible human. Scratches, bites, or contact with infectious saliva and bodily secretions transfer pathogens directly into host tissue without intermediate environmental or vector steps. Ingestion of animal products or insect bites represent indirect vehicle or vector transmission pathways.

**51.** (A) Diabetes first diagnosed during pregnancy in a woman without prior history of diabetes.
Gestational diabetes mellitus is defined as glucose intolerance resulting in hyperglycemia first recognized during pregnancy in women without pre-existing type 1 or type 2 diabetes. Placentally derived hormones, including human placental lactogen and cortisol, induce maternal peripheral insulin resistance, requiring elevated pancreatic insulin production to maintain normal maternal glycemic homeostasis.

Click Here to Buy book on Amazon

antibodies into blood and lymph. Cell-mediated immunity is mediated by T-lymphocytes, including cytotoxic T-cells that recognize and eliminate virus-infected cells or tumor cells, making both statement I and statement II accurate representations of adaptive immune function.

**71.** (B) Immediate wound washing with rabies vaccine and Rabies Immunoglobulin (RIG) administration
Category III animal bites involve transdermal exposures or contamination of mucous membranes with infectious saliva. Standard post-exposure prophylaxis mandates immediate, thorough wound cleansing with soap and water for fifteen minutes, administration of human rabies immunoglobulin directly into and around the bite site to provide immediate passive neutralization, and a complete active rabies vaccine series.

**72.** (C) Sustained human-to-human transmission of H5N1 is common and drives global human pandemics.
Avian influenza H5N1 is highly pathogenic in domestic poultry, causing severe disease. Human infections occur sporadically through direct contact with infected birds or contaminated farm environments. However, H5N1 currently lacks the structural ability to achieve sustained human-to-human transmission. Asserting that sustained human-to-human transmission is common and drives global human pandemics is incorrect.

**73.** (D) I, II and III
Bacillus anthracis causes three distinct clinical presentations depending on the entry portal of bacterial spores into host tissues. Spores entering broken skin cause cutaneous anthrax with characteristic necrotic eschars. Ingesting contaminated meat causes gastrointestinal anthrax with severe mucosal ulceration. Inhaling airborne spores causes inhalation anthrax with mediastinal widening and severe pulmonary dysfunction.

**74.** (A) Weakening the laboratory pathogen so it replicates without causing disease.
Live attenuated vaccines are created by passaging a wild pathogen through cell cultures under controlled laboratory conditions to reduce its virulence. The resulting attenuated strain retains the capacity to replicate within host tissue and stimulate robust humoral and cell-mediated adaptive immunity similar to natural infection, without producing severe clinical disease in immunocompetent individuals.

**75.** (B) Expected secondary cases from one infected person in a susceptible population.
In mathematical epidemiology, the basic reproduction number $R_0$ quantifies pathogen transmissibility. It represents the average number of secondary infectious cases generated by a single primary infected individual introduced into a completely susceptible population without prior immunity or control measures, directly determining the herd immunity threshold required to prevent sustained disease transmission.

**76.** (B) IgM
Immunoglobulin M is the first antibody isotype synthesized and secreted by naive B-cells during a primary adaptive immune response to a novel pathogen. Occurring as a heavy pentameric structure with ten antigen-binding sites, serum IgM efficiently agglutinates foreign antigens and activates the classical complement cascade long before class switching produces high-affinity IgG antibodies.

**77.** (A) H1N1 Swine Influenza
The 2009 global influenza pandemic was caused by a novel triple-reassortant strain of influenza A subtype H1N1, commonly referred to as swine flu. Combining gene segments from human, swine, and avian influenza lineages, this novel virus spread rapidly across international borders due to widespread lack of baseline immunity, leading WHO to declare a pandemic.

NODIA

**78.** (C) Direct contact with environment or food contaminated by urine of infected animals
Leptospirosis is a global zoonotic bacterial infection caused by pathogenic spirochetes of the genus Leptospira. Rodents and domestic livestock act as chronic carriers, shedding bacteria in their urine. Humans acquire the disease when broken skin or mucous membranes contact water, soil, or food contaminated with infected animal urine during agricultural activities or flooding.

**79.** (A) 2, 1, 3, 4
The adaptive immune response begins with specific antigen recognition by naive lymphocyte receptors. Upon activation, antigen-specific cells

**61.** (A) Rhabdoviridae
The rabies virus is a single-stranded, negative-sense, bullet-shaped enveloped RNA virus belonging to the Lyssavirus genus within the family Rhabdoviridae. Transmitted through animal saliva via bites or scratches, the virus exhibits strong neurotropism, migrating retrograde along peripheral nerves to the central nervous system, causing fatal acute encephalomyelitis in untreated human hosts.

**62.** (C) Hydrophobia
Hydrophobia is the pathognomonic clinical feature of furious human rabies. Patients experience severe involuntary pharyngeal muscle spasms when trying to drink liquid or even at the sight or sound of water. Triggered by central nervous system dysfunction and cranial nerve involvement, these agonizing painful spasms lead to extreme distress, dread of fluids, and characteristic agitation.

**63.** (D) P-3, Q-4, R-1, S-2
H1N1 influenza A virus causes swine flu. H5N1 influenza virus causes highly pathogenic avian influenza. Lyssavirus is the viral genus responsible for rabies infections. Bacillus anthracis is the spore-forming rod-shaped bacterium causing anthrax disease in animals and humans, establishing the matching sequence code P-3, Q-4, R-1, S-2.

**64.** (C) H1N1
Swine flu in humans is predominantly caused by the influenza A H1N1 subtype. In 2009, a reassortant strain containing genetic material from human, avian, and swine influenza viruses emerged, causing a global pandemic. H1N1 infects epithelial cells lining the upper and lower human respiratory tracts, causing fever, cough, myalgia, and acute respiratory illness.

**65.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Anthrax is a severe bacterial zoonosis affecting herbivorous animals and humans exposed to infected animal products. Bacillus anthracis forms metabolically inactive endospores when exposed to free oxygen. These bacterial endospores exhibit extreme resistance against desiccation, temperature extremes, and chemical disinfectants, surviving in soil for decades, which directly explains the persistent environmental transmission cycle.

**66.** (D) Consuming unpasteurized milk or dairy products from infected livestock
Brucellosis is a widespread bacterial zoonosis caused by species of the genus Brucella, such as Brucella abortus and Brucella melitensis. In humans, infection occurs most frequently via the gastrointestinal route following consumption of unpasteurized milk, cheese, or dairy products from infected cattle, sheep, or goats, leading to chronic undulant fever and systemic symptoms.

**67.** (A) Transfer of pre-formed antibodies providing immediate, temporary protection.
Passive immunity is conferred when pre-formed functional antibodies are transferred directly into a non-immune recipient. Because the host's immune system does not mount an endogenous immune response or generate memory cells, protection is immediate but transient, lasting only until the transferred immunoglobulins degrade naturally within circulating fluids, contrasting directly with active adaptive immunization.

**68.** (C) Indirect protection when a population threshold becomes immune, reducing pathogen spread.
Herd immunity represents a form of indirect epidemiological protection from infectious disease transmission that occurs when a sufficient percentage of a population becomes immune through vaccination or prior infection. This high immune density reduces available susceptible hosts, disrupting transmission chains and indirectly protecting non-immune individuals, such as infants or immunocompromised individuals.

**69.** (A) I and III only
The innate immune system delivers immediate, non-specific physiological defense against pathogens. Physical barriers like intact skin and mucous membranes prevent microbial entry, while innate phagocytic cells like macrophages engulf and destroy foreign invaders without requiring prior antigen exposure. T-lymphocytes and antibodies represent antigen-specific components of the acquired adaptive immune system, leaving items I and III correct.

**70.** (A) Both Statement I and Statement II are correct
Humoral immunity is mediated by B-lymphocytes, which differentiate into plasma cells that synthesize and secrete antigen-specific

Downloaded from www.pdf.tube

Staphylococcus aureus that have acquired resistance to beta-lactam antibiotics, including methicillin, penicillin, oxacillin, and amoxicillin. Mediated by the mecA gene encoding modified penicillin-binding proteins, MRSA causes severe hospital-acquired and community-associated skin, soft tissue, bloodstream, and surgical wound infections.

**89.** (D) Eliminating vector breeding sites, such as draining stagnant water bodies
Source reduction is a primary environmental management vector control strategy. It involves identifying, altering, or eliminating aquatic mosquito breeding sites to disrupt vector reproduction cycles. Practices such as draining stagnant water, filling ditches, covering water storage containers, and clearing urban debris eliminate larval microenvironments, permanently reducing vector population densities in targeted communities.

**90.** (A) Providing monthly financial support for the nutritional needs of notified TB patients
Nikshay Poshan Yojana is a direct benefit transfer scheme implemented under India's National Tuberculosis Elimination Programme. Recognizing that undernutrition weakens immune defenses and compromises treatment outcomes, the policy provides monthly financial support directly to the bank accounts of all notified tuberculosis patients throughout their treatment duration to support essential nutritional requirements.

**91.** (B) A sudden rise in case numbers exceeding baseline levels in a localized area
An endemic state represents the predictable, baseline presence of a disease within a given population or geography. In contrast, an outbreak or local epidemic occurs when the observed number of disease cases suddenly increases significantly above normal expected baseline levels within a defined geographical area over a specific timeframe, requiring immediate public health investigation.

**92.** (B) Plasmids
Plasmids are small, extrachromosomal, double-stranded circular DNA molecules that replicate independently of bacterial genomic DNA. Bacteria frequently transfer plasmids containing resistance genes between different bacterial species and genera through horizontal gene transfer mechanisms such as conjugation. This rapid sharing of genetic material facilitates widespread dissemination of multidrug antimicrobial resistance across clinical pathogens.

**93.** (A) Malaria
Indoor Residual Spraying is a key vector control intervention used to reduce malaria transmission. It involves applying long-acting chemical insecticides onto internal walls and ceilings where endophilic female Anopheles mosquitoes rest after feeding on humans. Coming into contact with sprayed surfaces kills adult mosquitoes, reducing vector survival rates and interrupting malaria transmission within communities.

**94.** (A) I and II only
Multidrug-resistant tuberculosis is defined as resistance to both isoniazid and rifampicin, the most effective first-line drugs. Bedaquiline is a diarylquinoline antibiotic specifically approved for treating resistant tuberculosis strains. Because Mycobacterium tuberculosis can disseminate through systemic circulation to infect extrapulmonary tissues like lymph nodes, meninges, and bones, statement III is incorrect.

**95.** (D) Mosquito-borne vector diseases such as malaria and dengue fever
Introducing larvivorous fish species, such as Gambusia affinis, into freshwater ponds, lakes, and urban water storage bodies serves as an effective biological vector control measure. These fish feed voraciously on mosquito larvae and pupae present at the water surface, suppressing adult mosquito emergence and significantly mitigating vector-borne diseases like malaria and dengue fever.

**96.** (C) The disease must originate exclusively from a laboratory accident.
The World Health Organization evaluates several epidemiological parameters when assessing pandemic potential, including human population susceptibility, disease severity, mortality rates, and efficient international human-to-human transmission. The origin of a novel pathogen—whether naturally emerging from wild reservoirs or otherwise—is not a required criterion for declaring a pandemic health emergency.

NODIA

(A) Pyramid of Energy
(B) Pyramid of Number
(C) Pyramid of Biomass
(D) Pyramid of Species

**11.** Which of the following is considered an artificial or man-made ecosystem?
(A) Tropical rainforest
(B) Agricultural field
(C) Coral reef
(D) Estuary

**12.** Match the items in List I with List II:
**List I: (Type of Ecosystem)**
P. Terrestrial Ecosystem
Q. Lotic Freshwater Ecosystem
R. Lentic Freshwater Ecosystem
S. Artificial Ecosystem
**List II: (Example)**
1. Pond
2. River
3. Aquarium
4. Grassland
Which of the following is the correct matching?
(A) P-4, Q-2, R-1, S-3
(B) P-4, Q-1, R-2, S-3
(C) P-3, Q-2, R-4, S-1
(D) P-2, Q-4, R-1, S-3

**13.** Which of the following is the most significant cause of ecological imbalance globally?
(A) Habitat destruction and fragmentation
(B) Afforestation programs
(C) Establishment of wildlife sanctuaries
(D) Transition to renewable energy sources

**14.** Which phenomenon occurs when nutrient enrichment of a water body leads to excessive algal growth, ultimately depleting dissolved oxygen?
(A) Biomagnification
(B) Desertification
(C) Eutrophication
(D) Siltation

**15.** The term 'climate change' primarily refers to:
(A) Short-term variations in daily local atmospheric conditions
(B) Seasonal weather fluctuations occurring within a single year
(C) Rapid atmospheric disturbances caused by volcanic eruptions
(D) Long-term shifts in global or regional climate patterns

**16.** What is the greenhouse effect?
(A) The cooling of the Earth due to the reflection of solar radiation by clouds
(B) The depletion of the ozone layer allowing more UV rays to enter
(C) The trapping of the sun's warmth in the lower atmosphere by certain gases
(D) The absorption of heat by ocean currents transporting it to the poles

**17.** Consider the following statements regarding the consequences of global warming:
I. It leads to the melting of polar ice caps and glaciers.
II. It causes a rise in global mean sea levels.
III. It decreases the frequency of extreme weather events.
IV. It can lead to shifts in the geographical ranges of various species.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**18.** Which surface has the highest albedo, thus reflecting the most solar radiation?
(A) Asphalt roads
(B) Dense forests
(C) Ocean water
(D) Fresh snow

**19.** Identify the correct sequence of trophic levels in a standard grazing food chain:
(A) Herbivores → Producers → Secondary Consumers → Tertiary Consumers
(B) Producers → Herbivores → Primary Carnivores → Secondary Carnivores
(C) Producers → Detritivores → Herbivores → Decomposers
(D) Primary Carnivores → Herbivores → Producers → Top Predators

**20.** Coral bleaching is primarily caused by:
(A) Overfishing in tropical waters
(B) High concentration of dissolved oxygen in seawater
(C) Thermal stress due to elevated ocean temperatures
(D) Accumulation of microplastics in polyps

**21.** Which of the following is NOT a greenhouse gas?
(A) Nitrogen ($N_2$)
(B) Carbon dioxide ($CO_2$)

Click Here to Buy book on Flipkart

silica particles trigger chronic pulmonary inflammation, progressive irreversible fibrosis, severe respiratory impairment, and disability.

**106.** (A) Daytime biting behavior and breeding in clean, stagnant water
Aedes aegypti is the primary urban vector transmitting dengue virus. It exhibits distinct anthropophilic feeding behaviors, predominantly biting humans during daylight hours, with peak activity in early morning and late afternoon. Females lay eggs in clean, artificial standing water containers, such as discarded tires, domestic pots, overhead tanks, and water coolers around residential areas.

**107.** (B) Orientia tsutsugamushi bacteria transmitted by infected larval chigger mites
Scrub typhus is an acute vector-borne zoonotic disease caused by the obligate intracellular bacterium Orientia tsutsugamushi. The infection is transmitted to humans through the bite of infected microscopic larval trombiculid mites, commonly called chiggers. The disease typically presents with acute fever, severe headache, generalized lymphadenopathy, and a pathognomonic dark necrotic skin eschar at the bite site.

**108.** (B) Integrated Health Information Platform
The Integrated Disease Surveillance Programme in India transitioned to the Integrated Health Information Platform. IHIP is a modern, real-time, web-based digital health surveillance system that enables web-enabled data entry, geospatial tracking, and automated disaggregated data analysis across syndromic, presumptive, and laboratory surveillance streams, facilitating early detection of disease outbreaks nationwide.

**109.** (A) Initial pathogen transmission from a vertebrate animal to a human.
In One Health epidemiology, zoonotic spillover refers specifically to the transmission event wherein a pathogenic organism—such as a virus, bacterium, or parasite—crosses the species barrier from a natural animal reservoir or intermediate host into a human host, potentially initiating localized infection or subsequent human-to-human disease transmission.

**110.** (C) Guinea worm disease
Rajasthan, along with all of India, successfully eradicated dracunculiasis, commonly known as Guinea worm disease. Caused by the parasitic nematode Dracunculus medinensis and transmitted through drinking water contaminated with water fleas containing parasite larvae, targeted public health initiatives, water filtration campaigns, and surveillance successfully eliminated indigenous transmission, leading to official WHO eradication certification.

**111.** (D) Fluoride
Chronic consumption of groundwater containing high concentrations of naturally occurring fluoride ions leads to fluorosis in endemic regions of Rajasthan. Dental fluorosis causes mottling, staining, and weakening of tooth enamel. Skeletal fluorosis leads to excessive bone accumulation, calcification of ligaments, joint stiffness, severe skeletal deformities, and chronic crippling pain affecting rural populations.

**112.** (C) Mukhyamantri Chiranjeevi Swasthya Bima Yojana
The Government of Rajasthan launched Mukhyamantri Chiranjeevi Swasthya Bima Yojana as a flagship universal health insurance scheme. It provides cashless secondary and tertiary medical coverage to eligible families across empanelled public and private hospitals, substantially reducing catastrophic out-of-pocket health expenditures for complex communicable and non-communicable medical conditions throughout the state.

**113.** (B) Collecting data based on specific symptoms before a definitive diagnosis is made
Syndromic surveillance involves collecting standardized data on clinical symptom clusters—such as acute fever, cough, or diarrhea—before laboratory confirmation or definitive clinical diagnosis is established. Executed primarily by health workers at the community level, this rapid symptom-based monitoring system allows public health authorities to spot unusual illness clusters early and launch immediate field investigations.

**114.** (A) Both Statement I and Statement II are correct
Prophylactic administration of sub-therapeutic antibiotic doses in food-producing animals applies selective pressure that favors resistant bacterial survival. These multidrug-resistant bacteria can subsequently spread from agricultural animals to humans through direct contact, environmental contamination, or consumption of contaminated

Downloaded from www.pdf.tube

food, demonstrating the critical One Health interface driving global antimicrobial resistance.

**115.** (A) Plasmodium vivax
Malaria remains endemic across various regions of Rajasthan, with two primary parasites circulating: Plasmodium vivax and Plasmodium falciparum. Epidemiological surveillance indicates that Plasmodium vivax accounts for the majority of reported clinical malaria infections in the state, utilizing hypnozoite liver stages that enable recurrent relapses in arid and semi-arid regional environments.

**116.** (C) Scrub Typhus
Scrub typhus is characterized by acute onset of fever, severe headache, generalized body aches, and the formation of a characteristic dark, cigarette-burn-like necrotic eschar at the site of a larval chigger mite bite. In rural Rajasthan, presenting with acute febrile illness accompanied by a localized eschar skin lesion strongly indicates a clinical diagnosis of scrub typhus.

**117.** (A) Observed cases exceed expected numbers for a place and time.
Under epidemiology guidelines and IDSP frameworks, an outbreak or localized epidemic is defined as the occurrence of disease cases in excess of baseline expectation for a given geographic area, population, and time period. Detecting a sudden increase above expected baseline levels triggers rapid epidemiological field investigations and outbreak containment measures.

**118.** (D) Mass dog vaccination combined with human awareness and timely PEP
Applying a comprehensive One Health strategy against rabies combines human and animal interventions. Mass dog vaccination campaigns eliminate rabies transmission at its primary animal source, while public health education promotes responsible pet ownership and immediate post-exposure prophylaxis for bitten individuals, providing an effective framework for achieving zero human rabies deaths globally.

**119.** (B) Rajasthan has eliminated TB and has the lowest incidence rate in India.
Tuberculosis remains a major public health challenge across India, including Rajasthan, which continues to register significant annual case burdens. Asserting that Rajasthan has eliminated tuberculosis and maintains the lowest incidence rate in the country is factually incorrect, whereas mandatory case notification, rapid molecular testing, and financial support under Nikshay Poshan Yojana reflect active ongoing policies.

**120.** (C) Japanese Encephalitis
Japanese encephalitis virus transmission requires Culex mosquitoes breeding in flooded rice paddies and presence of ardeid birds or swine reservoirs. In contrast to endemic malaria, dengue, and scrub typhus, Japanese encephalitis is extremely rare in the dry, arid, and semi-arid landscape of western Rajasthan, which lacks extensive wetland habitats needed to sustain its transmission cycle.

**121.** (D) By expanding mosquito geographic ranges and lengthening transmission seasons through warming temperatures
Global climate change directly influences vector-borne disease dynamics. Warming ambient temperatures accelerate mosquito larval development rates, shorten extrinsic pathogen incubation periods inside vectors, and extend vector seasonal activity windows. Additionally, altered precipitation patterns and temperature shifts permit vector mosquitoes like Anopheles and Aedes to expand their geographic ranges into higher altitudes and previously temperate latitudes.

**122.** (A) Waterborne cholera and typhoid
Extreme weather events like intense monsoons and flooding disrupt municipal sanitation infrastructure and contaminate municipal water distribution systems with raw sewage and runoff. These sudden sanitary breakdowns create ideal conditions for rapid spread of waterborne enteric pathogens, dramatically increasing immediate risk of explosive outbreaks of waterborne diseases like cholera, typhoid fever, and dysentery.

NODIA

**123.** (B) Malaria
The El Niño-Southern Oscillation climate phenomenon alters global temperature and precipitation dynamics. In many tropical regions, El Niño events cause uncharacteristic heavy rainfall or abnormal drought that alters river hydrology, creating abundant stagnant pools ideal for Anopheles mosquito breeding. Elevated ambient temperatures further accelerate vector reproduction and parasite development, historically driving epidemic malaria resurgences.

**124.** (B) The time from pathogen exposure to the appearance of first clinical symptoms.
In infectious disease epidemiology, the incubation period represents the time interval elapsed between initial host exposure to a pathogenic organism and the onset of the first clinical signs or symptoms of disease. During this latent physiological phase, the pathogen multiplies inside host tissues without causing detectable clinical symptoms.

**125.** (A) An asymptomatic bacterial carrier who unknowingly infected others.
Mary Mallon, known as "Typhoid Mary," was an asymptomatic carrier of Salmonella enterica serovar Typhi in the early twentieth century. Harboring the bacteria in her gallbladder, she shed pathogens without displaying clinical symptoms, unknowingly transmitting typhoid fever to numerous households where she worked as a cook, demonstrating the epidemiological role of chronic healthy carriers.

**126.** (C) Rising temperatures shorten the pathogen extrinsic incubation period in mosquitoes, accelerating transmission.
Elevated ambient temperatures accelerate the metabolic rate of vector mosquitoes and the replication speed of pathogens residing within them. This significantly shortens the extrinsic incubation period—the time required for ingested pathogens to replicate and migrate to mosquito salivary glands. Shorter extrinsic incubation periods allow mosquitoes to become infectious sooner, accelerating disease transmission rates.

**127.** (D) Deforestation forcing wildlife, livestock, and humans into close contact
Deforestation and land conversion fragment natural forest ecosystems, destroying natural wildlife habitats. Displaced reservoir species, such as fruit bats carrying Nipah or Ebola viruses, move closer to human settlements and agricultural zones. Increased proximity among wild reservoir animals, domestic livestock, and human populations facilitates cross-species pathogen spillover events, driving the emergence of novel zoonotic outbreaks.

**128.** (C) Whooping cough
Pertussis is commonly known as whooping cough. Caused by the bacterium Bordetella pertussis, this acute respiratory infection damages ciliated respiratory epithelial cells through toxin production. It causes violent, uncontrollable paroxysmal coughing fits followed by a high-pitched inspiratory "whoop" sound as the patient struggles to draw breath, predominantly affecting unimmunized young children.

**129.** (B) Subsequent infection occurs with a different dengue viral serotype.
Dengue virus exists as four distinct antigenic serotypes. Primary infection confers lifelong homotypic immunity against that specific serotype. However, secondary heterotypic infection with a different serotype increases risk of Dengue Hemorrhagic Fever via antibody-dependent enhancement, where non-neutralizing cross-reactive antibodies facilitate viral uptake into host monocytes, escalating viral load and severe vascular leakage.

**130.** (D) Infected humans
In the Indian subcontinent, visceral leishmaniasis (Kala-azar), caused by Leishmania donovani, exhibits an anthroponotic transmission cycle. Unlike in other global regions where animal reservoirs predominate, infected humans serve as the primary reservoir host for the parasite. Phlebotomus argentipes sandflies acquire flagellated parasites when feeding on infected humans and subsequently transmit them to susceptible individuals.

**131.** (A) Warmer sea temperatures and algal blooms favor Vibrio cholerae proliferation.
Vibrio cholerae exists naturally in aquatic coastal ecosystems, attached to chitinous zooplankton. Rising sea surface temperatures combined with climate-driven nutrient runoff foster extensive phytoplankton and zooplankton algal blooms. These ecological shifts accelerate Vibrio cholerae bacterial multiplication, increasing pathogen concentration in coastal waters and heightening risk of waterborne cholera outbreaks in coastal populations.

**132.** (C) A stroke affects blood supply to the brain, whereas a heart attack affects blood supply to the heart muscle.
Both conditions are acute cardiovascular emergencies caused by vascular occlusion or rupture. A cerebrovascular accident (stroke) occurs when cerebral blood flow is disrupted by a thrombus or hemorrhage, causing neurological tissue ischemia in the brain. A myocardial infarction (heart attack) occurs when a coronary

Click Here to Buy book on Amazon

**97.** (B) It views AMR as an interconnected threat across human, animal, and environmental sectors.
The One Health paradigm recognizes that human, animal, and environmental health are intrinsically linked. In the context of antimicrobial resistance, it acknowledges that antibiotic overuse in livestock, agricultural runoff into soil and waterways, and human clinical misuse contribute mutually to selecting and spreading multidrug-resistant pathogens, requiring integrated, cross-sectoral interventions and policy frameworks.

**98.** (D) Annual Parasite Incidence
In epidemiological malaria surveillance, API stands for Annual Parasite Incidence. It quantifies disease burden by calculating the number of confirmed laboratory-proven malaria cases reported per thousand population within a given geographic area over one year. Public health authorities use API values to stratify regional malaria risk and deploy targeted vector control interventions.

**99.** (A) Tuberculosis and COVID-19
Cartridge-Based Nucleic Acid Amplification Tests, such as GeneXpert, and TrueNat are automated rapid molecular diagnostic platforms. They amplify specific pathogen DNA or RNA sequences to rapidly detect Mycobacterium tuberculosis, alongside rifampicin resistance mutations, and viral RNA from SARS-CoV-2, providing accurate, decentralized diagnostic results within hours to guide immediate clinical treatment decisions.

**100.** (A) I, II and III only
Standard vector control interventions include long-lasting insecticidal nets to prevent mosquito bites, larvicides applied to aquatic breeding sites to halt development, and emergency fogging to kill adult vectors during active disease outbreaks. Administering prophylactic antibiotics universally is ineffective against viral or protozoan vector-borne pathogens and accelerates drug resistance, excluding item IV.

**101.** (A) Presumptive cases reporting format
India's Integrated Disease Surveillance Programme collects health data using three standardized reporting formats. The 'S' form collects syndromic surveillance data recorded by paramedical workers. The 'P' form records presumptive disease cases diagnosed clinically by medical officers based on presenting signs and symptoms. The 'L' form captures laboratory-confirmed cases reported directly by diagnostic facilities.

**102.** (D) To rapidly detect and respond to disease outbreaks using decentralized surveillance
The primary objective of India's Integrated Disease Surveillance Programme is to establish a decentralized, state-based surveillance system for epidemic-prone communicable diseases. By continuously gathering syndromic, clinical, and laboratory data, the programme aims to detect early warning signals of disease outbreaks, enabling rapid public health investigation and timely response actions to minimize morbidity.

**103.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The One Health framework is essential for controlling zoonotic diseases because most emerging human pathogens originate in animal populations. Zoonotic spillovers occur across complex ecological interfaces where human activity, animal husbandry, and environmental changes intersect. Addressing these interdisciplinary risk drivers through joint human, veterinary, and environmental surveillance directly enables effective disease prevention and control.

**104.** (C) Deforestation and agricultural expansion increasing human-wildlife contact
Environmental degradation, tropical deforestation, and agricultural expansion encroach upon natural wildlife habitats, fragmenting ecosystems. This ecological disruption alters wildlife behavior and forces wild animals, livestock, and human populations into closer proximity. Increased human-animal contact provides opportunities for novel pathogens to cross species barriers, making habitat destruction a primary driver of emerging zoonotic diseases.

**105.** (D) Silicosis
Rajasthan established a dedicated policy for the prevention, control, and rehabilitation of silicosis. Silicosis is an irreversible occupational lung disease caused by chronic inhalation of microscopic crystalline silica dust generated during mining, stone carving, sandstone grinding, and quarrying operations. Inhaled

NODIA

# CHAPTER 10
# Environmental and Ecological Changes

**1.** Which of the following best defines an ecosystem?
(A) The physical environment where an organism lives
(B) A community of organisms interacting with each other and their physical environment
(C) A large geographical area characterized by its climate and vegetation
(D) The total number of living organisms in a given geographical region

**2.** Which of the following is an abiotic component of an ecosystem?
(A) Decomposers
(B) Producers
(C) Pathogens
(D) Sunlight

**3.** What is the primary role of saprophytes (decomposers) in an ecosystem?
(A) To breakdown complex organic matter into simpler inorganic substances
(B) To convert solar energy into chemical energy
(C) To consume primary consumers for energy transfer
(D) To regulate the population of tertiary consumers

**4.** In a standard terrestrial ecosystem, which organism occupies the first trophic level?
(A) Herbivores
(B) Primary carnivores
(C) Autotrophs
(D) Detritivores

**5.** Consider the following statements regarding the structure of an ecosystem:
I. Both biotic and abiotic components are static and do not change over time.
II. Stratification is the vertical distribution of different species occupying different levels.
III. The amount of living matter present at a given time is known as the standing crop.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**6.** The concept of a food web is best described as:
(A) A linear sequence of organisms through which nutrients and energy pass
(B) The total mass of interacting organisms in a specific trophic level
(C) The maximum number of individuals an environment can sustainably support
(D) A complex network of interconnected food chains within an ecosystem

**7.** According to the ten percent law of energy transfer, if 10,000 Joules of solar energy falls on green plants, approximately how much energy is converted into food energy by the producers?
(A) 10,000 Joules
(B) 1,000 Joules
(C) 100 Joules
(D) 10 Joules

**8.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** The flow of energy in an ecosystem is always unidirectional.
**Reason (R):** Energy captured by autotrophs does not revert back to the solar input and progressively decreases at each trophic level.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**9.** In an aquatic ecosystem, which of the following forms the major part of the primary producers?
(A) Zooplankton
(B) Small fishes
(C) Benthic scavengers
(D) Phytoplankton

**10.** Which ecological pyramid is always upright and can never be inverted?

Downloaded from www.pdf.tube

(C) Mercury
(D) Arsenic

**33.** In several districts of Rajasthan, prolonged consumption of groundwater has led to skeletal deformities and dental mottling. This is primarily due to the excess presence of:
(A) Nitrates
(B) Fluoride
(C) Arsenic
(D) Iron

**34.** Match the items in List I with List II:
**List I: (Pollutant/Contaminant)**
P. Excess Nitrate in drinking water
Q. Cadmium contamination
R. Excess Fluoride
S. Asbestos fibers
**List II: (Associated Health Condition)**
1. Fluorosis
2. Blue Baby Syndrome (Methemoglobinemia)
3. Itai-Itai disease
4. Asbestosis
Which of the following is the correct matching?
(A) P-2, Q-3, R-1, S-4
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

**35.** Which of the following is an INCORRECT statement regarding soil degradation?
(A) Monoculture farming effectively preserves overall soil nutrient diversity.
(B) Unregulated application of chemical fertilizers severely alters natural soil pH levels.
(C) Large-scale deforestation rapidly accelerates topsoil erosion by wind and surface water runoff.
(D) Soil salinization commonly occurs due to improper agricultural irrigation in arid regions.

**36.** The process of using microorganisms to degrade or remove environmental pollutants from soil or water is called:
(A) Biomagnification
(B) Bioaccumulation
(C) Bioremediation
(D) Biofortification

**37.** Noise pollution is generally measured in which of the following units?
(A) Decibels
(B) Hertz
(C) Joules
(D) Watts

**38.** Consider the following statements about the health effects of chronic noise pollution:
I. It can cause permanent hearing impairment.
II. It leads to increased blood pressure and cardiovascular issues.
III. It improves cognitive focus and productivity.
IV. It can result in sleep disturbances and psychological stress.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**39.** According to the Noise Pollution (Regulation and Control) Rules in India, what is the permissible noise level in a residential area during the daytime?
(A) 75 dB(A)
(B) 65 dB(A)
(C) 55 dB(A)
(D) 45 dB(A)

**40.** Thermal pollution of water bodies, often caused by power plants discharging hot water, negatively affects aquatic life primarily by:
(A) Significantly elevating the dissolved oxygen capacity of aquatic habitats
(B) Accelerating the synthetic synthesis and accumulation of heavy metals
(C) Reducing the dissolved oxygen holding capacity of warm water
(D) Raising the overall chemical pH level to render water highly alkaline

NODIA

**41.** Which of the following is the most dominant cause of deforestation globally?
(A) Rapid urbanization and large-scale infrastructure development projects
(B) Naturally occurring and human-induced wildfire events in dense forests
(C) Commercial mining operations and mineral extraction activities
(D) Agricultural expansion and livestock grazing

**42.** Identify the correct sequence of the stages of water erosion of soil, from initial to most severe:
(A) Gully erosion → Rill erosion → Sheet erosion → Splash erosion
(B) Splash erosion → Sheet erosion → Rill

(C) Methane ($CH_4$)
(D) Nitrous oxide ($N_2O$)

**22.** Which greenhouse gas is predominantly released from paddy fields and the digestive tracts of ruminant animals?
(A) Chlorofluorocarbons
(B) Ozone
(C) Sulphur dioxide
(D) Methane

**23.** Arrange the following greenhouse gases in decreasing order of their contribution to the total global greenhouse effect:
1. Carbon dioxide
2. Methane
3. Chlorofluorocarbons (CFCs)
4. Nitrous oxide

Select the correct order:
(A) 1, 2, 3, 4
(B) 1, 3, 2, 4
(C) 2, 1, 4, 3
(D) 1, 2, 4, 3

**24.** The stratospheric ozone layer protects the Earth primarily from which type of solar radiation?
(A) High-energy thermal infrared radiation
(B) Short-wavelength atmospheric X-rays
(C) Solar Ultraviolet-B (UV-B) radiation
(D) Ionizing cosmic-origin gamma rays

**25.** Which element, released from the breakdown of Chlorofluorocarbons (CFCs), acts as a catalyst in the destruction of ozone molecules?
(A) Fluorine
(B) Carbon
(C) Hydrogen
(D) Chlorine

**26.** The thickness of the ozone layer is measured in which unit?
(A) Dobson Units (DU)
(B) Decibels (dB)
(C) Parts per million (ppm)
(D) Millisieverts (mSv)

**27.** Consider the following statements regarding air pollutants:
I. Primary pollutants are emitted directly from a source.
II. Ozone in the troposphere is a primary pollutant.
III. Smog is considered a secondary pollutant.

Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**28.** Photochemical smog is primarily composed of:
(A) Ground-level sulphur dioxide, toxic particulate matter, and acidic fog
(B) Tropospheric ozone, peroxyacetyl nitrate, and nitrogen oxides
(C) Poisonous carbon monoxide, smoke particles, and unburnt hydrocarbons
(D) Atmospheric volatile organic compounds, industrial dust, and fog

**29.** PM 2.5 refers to particulate matter that has a diameter of less than:
(A) 2.5 millimeters
(B) 2.5 micrometers
(C) 2.5 nanometers
(D) 2.5 centimeters

**30.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** Ozone present in the troposphere is harmful to plants and animals.
**Reason (R):** Tropospheric ozone is a strong oxidant and a major component of photochemical smog.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**31.** Biochemical Oxygen Demand (BOD) is a standard measure for:
(A) Total dissolved oxygen gas available to sustain aerobic aquatic organisms
(B) Concentration of dangerous heavy metal ions in a contaminated river
(C) Gross rate of photosynthetic activity achieved by freshwater organisms
(D) Oxygen required by bacteria to degrade organic matter in water

**32.** Minamata disease is a neurological syndrome caused by severe poisoning of which heavy metal in water bodies?
(A) Lead
(B) Cadmium

Click Here to Buy book on Flipkart

artery is occluded, causing ischemic damage specifically to heart muscle tissue.

**133.** (A) Polyphagia
The classic clinical triad indicative of diabetes mellitus comprises polyuria (frequent urination), polydipsia (excessive thirst), and polyphagia (excessive hunger). Polyuria results from osmotic diuresis triggered by glycosuria, driving fluid loss and polydipsia. Polyphagia develops because intracellular glucose starvation, caused by absolute or relative insulin insufficiency, signals persistent metabolic hunger to hypothalamic satiety centers.

**134.** (D) Cervical cancer
The Papanicolaou smear is a secondary preventive screening procedure designed for early detection of cervical dysplasia and carcinoma. By collecting scraped cells from the transformation zone of the uterine cervix, cytological examination identifies pre-malignant cellular changes caused by persistent high-risk human papillomavirus infection, allowing timely medical intervention before invasive cervical cancer develops.

**135.** (B) Sphygmomanometer
A sphygmomanometer is the standard clinical instrument used to measure arterial blood pressure. Comprising an inflatable cuff, a pressure gauge, and a rubber bulb, it works alongside a stethoscope to detect Korotkoff sounds during arterial deflation, providing accurate numerical readings of systolic and diastolic blood pressure needed to diagnose and manage hypertension.

**136.** (C) Fruit bats
Nipah virus is a zoonotic Henipavirus that causes severe encephalitis and respiratory distress in humans. Pteropus fruit bats, commonly called flying foxes, serve as the natural reservoir host for the virus. Transmission to humans occurs through direct exposure to infected bat secretions, consuming date palm sap contaminated by bats, intermediate domestic swine hosts, or human-to-human contact.

**137.** (D) Natural passive immunity
Transplacental transfer of maternal immunoglobulin G antibodies to the developing fetus represents natural passive immunity. Maternal antibodies pass naturally across the placental barrier into fetal circulation, conferring immediate humoral protection against specific pathogens during early infancy. This protection is passive and temporary, declining as maternal antibodies naturally degrade without generating host immunological memory.

**138.** (A) A rapid rise to a single peak followed by a gradual decline after simultaneous common exposure.
A point-source epidemic curve occurs when a group of susceptible individuals experiences brief, simultaneous exposure to a single common infectious source or vehicle. The resulting epidemic curve features a sharp, rapid rise in case numbers clustering within a single incubation period, reaching a clear peak followed by a gradual, smooth decline as exposed cases resolve.

**139.** (B) Routine growth-promotional use of medically important antibiotics in healthy food animals
The World Health Organization strongly criticizes routine sub-therapeutic administration of medically important antibiotics in healthy livestock for growth promotion or disease prevention. This agricultural practice applies continuous selective pressure, favoring selection and amplification of resistant bacterial strains in food animals, which can subsequently transfer to human populations through direct contact or contaminated meat products.

**140.** (B) The release and reactivation of ancient viable pathogens frozen in permafrost
As global warming thaws Arctic permafrost soils, microbiologists warn against the potential release and reactivation of ancient pathogenic bacteria, viruses, or fungal spores preserved in frozen strata for millennia. Thawing permafrost could reintroduce long-dormant infectious agents into modern ecosystems, posing unknown biosecurity risks to humans, livestock, and vulnerable polar wildlife species lacking immunity.

NODIA

erosion → Gully erosion
(C) Sheet erosion → Splash erosion → Gully erosion → Rill erosion
(D) Rill erosion → Gully erosion → Splash erosion → Sheet erosion

**43.** Which prominent institute, headquartered in Jodhpur, Rajasthan, is dedicated to research on desertification and arid zone ecology?
(A) Forest Survey of India (FSI)
(B) Central Arid Zone Research Institute (CAZRI)
(C) Wildlife Institute of India (WII)
(D) National Environmental Engineering Research Institute (NEERI)

**44.** The process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture, is known as:
(A) Salinization
(B) Desertification
(C) Podzolization
(D) Laterization

**45.** Consider the following statements regarding Acid Rain:
I. It is primarily caused by emissions of sulfur dioxide and nitrogen oxides.
II. It increases the pH of soil and aquatic ecosystems.
III. It can accelerate the decay of building materials and monuments.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**46.** Normal, unpolluted rain has a slightly acidic pH due to the presence of dissolved carbon dioxide. Acid rain is generally defined as having a pH lower than:
(A) 7.0
(B) 6.5
(C) 5.6
(D) 4.0

**47.** The term 'Stone Cancer' is most frequently associated with the damage caused to monuments like the Taj Mahal by which environmental phenomenon?
(A) Global warming
(B) Ozone depletion
(C) Photochemical smog
(D) Acid rain

**48.** In the context of Rajasthan, 'Shelterbelts' are planted primarily to:
(A) Prevent rapid evaporation loss of freshwater from regional open irrigation canals
(B) Provide natural thermal shelter to endangered local wildlife during extreme summer heat
(C) Reduce wind erosion and check sand dune movement
(D) Absorb excessive chemical salinity accumulated in degraded agricultural crop lands

NODIA

**49.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** Large-scale deforestation can lead to a reduction in regional rainfall.
**Reason (R):** Trees release water vapor into the atmosphere through transpiration, which contributes to cloud formation.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**50.** The introduction of the Indira Gandhi Canal in western Rajasthan has brought significant agricultural benefits. However, it has also led to a major ecological problem in the command area, which is:
(A) Widespread and severe depletion of regional deep groundwater aquifers
(B) Frequent occurrence of unseasonal destructive flash flood events
(C) Absolute eradication of native indigenous desert grasses and shrubs
(D) Waterlogging and soil salinization

**51.** The primary goal of the Paris Agreement on climate change is to limit global warming to well below:
(A) Strictly 1.5 degrees Celsius above historical baseline pre-industrial temperature levels
(B) 2.0°C above pre-industrial levels, pursuing 1.5°C
(C) Up to 3.0 degrees Celsius above historical baseline pre-industrial temperature levels

(B) Reducing the emission of greenhouse gases to tackle the root cause
(C) Building seawalls to protect coastal areas from rising sea levels
(D) Developing drought-resistant crop varieties

**72.** Arrange the categories of the National Air Quality Index (AQI) of India in increasing order of health severity:
1. Moderate
2. Good
3. Severe
4. Satisfactory
5. Poor

Select the correct order:
(A) 2, 4, 1, 5, 3
(B) 2, 1, 4, 5, 3
(C) 4, 2, 1, 3, 5
(D) 1, 2, 4, 5, 3

**73.** India's current comprehensive National Environment Policy was formally formulated and adopted in the year:
(A) 1986
(B) 1992
(C) 2006
(D) 2014

**74.** The National Air Quality Index (AQI) considers the concentration of eight pollutants. Which of the following is NOT one of those eight pollutants?
(A) Carbon dioxide
(B) Carbon monoxide
(C) Gaseous ammonia
(D) Particulate lead

**75.** Match the items in List I with List II:
**List I: (Environmental Term)**
P. Carbon Sequestration
Q. Bioaccumulation
R. Biomagnification
S. Endemism
**List II: (Meaning/Context)**
1. Gradual increase of a pollutant concentration up the food chain
2. Capture and long-term storage of atmospheric carbon dioxide
3. Species being uniquely found in a specific geographic location
4. Gradual accumulation of substances, such as pesticides, in an organism

Which of the following is the correct matching?
(A) P-2, Q-4, R-1, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-1, R-4, S-3
(D) P-4, Q-2, R-1, S-3

**76.** The decline in forest area in the Aravalli ranges of Rajasthan is most strongly attributed to:
(A) Heavy monsoonal floods washing away topsoil
(B) Illegal mining and excessive quarrying activities
(C) Volcanic eruptions altering the terrain
(D) Natural forest fires occurring in the winter season

**77.** In the context of groundwater resources in Rajasthan, 'Dark Zones' refer to areas where:
(A) Groundwater extraction exceeds the annual rate of groundwater recharge.
(B) The groundwater is severely contaminated with petroleum products.
(C) There is no penetration of sunlight into local aquifers.
(D) The soil color has darkened due to excessive use of chemical fertilizers.

**78.** Consider the following statements regarding plastic pollution:
I. Microplastics are plastic fragments smaller than 5 millimeters in length.
II. Plastics are highly biodegradable and break down quickly in marine environments.
III. Burning plastic waste openly releases toxic gases like dioxins.
IV. Single-use plastics constitute a major portion of terrestrial and marine plastic debris.

Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I, II and IV

**79.** The Government of India imposed a nationwide ban on the manufacture, import, stocking, distribution, sale, and use of identified single-use plastic items with effect from:
(A) 1st January 2021
(B) 1st July 2022
(C) 2nd October 2023
(D) 1st April 2020

**80.** The primary environmental hazard of persistent organic pollutants (POPs) is that they:
(A) Cause rapid severe depletion of protective atmospheric ozone layer in the high upper

Downloaded from www.pdf.tube

**61.** Which of the Sustainable Development Goals (SDGs) specifically calls for urgent action to combat climate change and its impacts?
(A) SDG 7
(B) SDG 11
(C) SDG 13
(D) SDG 15

**62.** Identify the correct logical sequence of processes in the Nitrogen Cycle:
(A) Nitrogen Fixation → Nitrification → Assimilation → Ammonification → Denitrification
(B) Nitrification → Nitrogen Fixation → Ammonification → Assimilation → Denitrification
(C) Denitrification → Assimilation → Nitrification → Nitrogen Fixation → Ammonification
(D) Ammonification → Nitrogen Fixation → Denitrification → Nitrification → Assimilation

**63.** Which of the following acts as the largest active carbon sink on Earth?
(A) The atmosphere
(B) Terrestrial forests
(C) Fossil fuel reserves
(D) The oceans

**64.** Unlike the carbon and nitrogen cycles, the phosphorus cycle is considered a sedimentary cycle because:
(A) Phosphorus does not enter living organisms.
(B) Phosphorus is primarily cycled through lightning strikes.
(C) It does not have a significant atmospheric gaseous phase.
(D) It is only found in deep oceanic trenches.

**65.** Consider the following ecological functions of wetlands:
I. They act as sponges, mitigating floods by absorbing excess water.
II. They purify water by trapping pollutants and heavy metals.
III. They serve as critical habitats for migratory birds.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

NODIA

**66.** The Ramsar Convention, signed in 1971, is an international treaty primarily dedicated to the conservation and sustainable use of:
(A) Coral reefs
(B) Tropical rainforests
(C) Desert ecosystems
(D) Wetlands

**67.** Which of the following pairs of Ramsar sites is located in Rajasthan?
(A) Keoladeo National Park and Sambhar Lake
(B) Chilika Lake and Bhitarkanika Mangroves
(C) Harike Lake and Kanjli Wetland
(D) Wular Lake and Tsomoriri

**68.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** Wetlands are often referred to as the 'kidneys of the landscape'.
**Reason (R):** Wetlands help in filtering pollutants and purifying the water flowing through them.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**69.** Avian botulism recently caused the mass mortality of thousands of migratory birds at which prominent wetland in Rajasthan?
(A) Sambhar Lake
(B) Nakki Lake
(C) Pichola Lake
(D) Ana Sagar Lake

**70.** The Montreux Record is a register of wetland sites on the List of Wetlands of International Importance where changes in ecological character have occurred, are occurring, or are likely to occur. Which site from Rajasthan is currently on this record?
(A) Sambhar Lake
(B) Jawai Dam
(C) Siliserh Lake
(D) Keoladeo National Park

**71.** In climate change policy, 'Mitigation' differs from 'Adaptation' in that mitigation focuses on:
(A) Adjusting to the present or future climate impacts to minimize damage

(D) Below 0.5 degrees Celsius above historical baseline pre-industrial temperature levels

**52.** Arrange the following landmark environmental protocols/agreements in chronological order of their adoption:
1. Paris Agreement
2. Kyoto Protocol
3. Montreal Protocol
4. Kigali Amendment

Select the correct order:
(A) 3, 2, 1, 4
(B) 2, 3, 1, 4
(C) 3, 1, 2, 4
(D) 1, 2, 4, 3

**53.** The Conference of the Parties (COP) is the supreme decision-making body of which international environmental convention?
(A) Convention on Biological Diversity (CBD)
(B) United Nations Framework Convention on Climate Change (UNFCCC)
(C) United Nations Convention to Combat Desertification (UNCCD)
(D) All of the above have a COP structure

**54.** The concept of 'Carbon Credit' originated from which of the following international agreements?
(A) Montreal Protocol
(B) Earth Summit, Rio
(C) Vienna Convention
(D) Kyoto Protocol

**55.** Match the items in List I with List II:
**List I: (International Agreement)**
P. Montreal Protocol
Q. Basel Convention
R. Stockholm Convention
S. UNFCCC

**List II: (Core Objective)**
1. Control of transboundary movements of hazardous wastes
2. Phasing out ozone-depleting substances
3. Stabilization of greenhouse gas concentrations
4. Elimination of Persistent Organic Pollutants (POPs)

Which of the following is the correct matching?
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**56.** The National Green Tribunal (NGT) in India was established in which year?
(A) 2002
(B) 2010
(C) 2014
(D) 1998

**57.** Which of the following laws does NOT fall under the civil jurisdiction of the National Green Tribunal (NGT)?
(A) The Water (Prevention and Control of Pollution) Act, 1974
(B) The Forest (Conservation) Act, 1980
(C) The Environment (Protection) Act, 1986
(D) The Wildlife (Protection) Act, 1972

**58.** Consider the following statements regarding the Environmental Impact Assessment (EIA) process in India:
I. Screening determines whether a project requires an EIA and if so, of what level.
II. Scoping identifies the key issues and impacts that need further investigation.
III. Public consultation is completely optional for all Category A projects.
IV. Appraisal is the final stage where the regulatory authority grants or rejects clearance.

Which of the above statement(s) is/are correct?
(A) I, II and III
(B) II, III and IV
(C) I, II and IV
(D) I, III and IV

**59.** In the context of EIA, what is the primary purpose of baseline data collection?
(A) To evaluate the comprehensive financial profitability and long-term economic viability of the proposed industrial project
(B) To document baseline environmental conditions before project commencement
(C) To accurately calculate the volume of tradable carbon credits a commercial project can potential earn
(D) To mandate specific manufacturing equipment and technological machinery to be deployed in the project facility

**60.** Under the EIA notification of India, which category of projects requires mandatory environmental clearance from the Central Government without exception?
(A) Category $B_1$
(B) Category A
(C) Category $B_2$
(D) Category C

Click Here to Buy book on Amazon

mesosphere
(B) Dissolve rapidly in surface water bodies and evaporate quickly into ambient atmospheric air
(C) Persist in ecosystems and bioaccumulate in animal fatty tissues
(D) Contribute directly and exclusively to severe urban noise pollution in high-density areas

**81.** Which biome is characterized by permafrost, low temperatures, and a very short growing season?
(A) Taiga
(B) Tundra
(C) Savanna
(D) Chaparral

**82.** Consider the following statements about the water cycle:
I. Evaporation and transpiration are processes that add water vapor to the atmosphere.
II. Precipitation is the sole mechanism by which water moves from the land to the ocean.
III. Condensation is responsible for cloud formation.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**83.** The transition zone between two distinct biological communities, which is often highly diverse, is termed:
(A) Ecotone
(B) Ecotype
(C) Ecosphere
(D) Ecological niche

**84.** Which functional group forms the base of every detritus food chain?
(A) Photosynthetic primary producers
(B) Secondary consumer carnivores
(C) Non-living detritus
(D) Primary consumer herbivores

**85.** Consider the following statements concerning ecological succession:
I. Primary succession occurs on bare rock where no soil previously existed.
II. Secondary succession is faster than primary succession.
III. The climax community is the stable, final stage of succession.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**86.** Which type of species, if removed from an ecosystem, causes a disproportionately large impact on the overall structure and functioning of that ecosystem?
(A) Invasive species
(B) Endemic species
(C) Indicator species
(D) Keystone species

**87.** The term 'Smog' was originally coined to describe a mixture of:
(A) Sulfur and oxygen
(B) Smoke and fog
(C) Snow and fog
(D) Silica and organic matter

**88.** Lichens are considered highly sensitive to air pollution and are widely used as bioindicators for which specific pollutant?
(A) Carbon dioxide
(B) Methane
(C) Sulfur dioxide
(D) Ozone

NODIA

**89.** Global warming potential (GWP) is a measure of how much heat a greenhouse gas traps in the atmosphere relative to:
(A) Atmospheric methane gas
(B) Ambient water vapor
(C) Gaseous nitrous oxide
(D) Carbon dioxide

**90.** Which of the following is NOT a recognized method of controlling particulate matter emissions from industrial smokestacks?
(A) Catalytic converters
(B) Electrostatic precipitators
(C) Fabric filters (Baghouses)
(D) Wet scrubbers

**91.** The gradual accumulation of salts in the upper soil layers, heavily impacting agricultural productivity in arid regions like Rajasthan, is called:
(A) Desertification
(B) Salinization
(C) Podzolization
(D) Leaching

(C) Pali and Balotra
(D) Churu

**111.** High concentration of which gas in the atmosphere causes the 'Greenhouse Effect' predominantly by absorbing infrared radiation emitted by the Earth?
(A) Molecular Nitrogen
(B) Atmospheric Oxygen
(C) Elemental Argon
(D) Carbon Dioxide

**112.** Barkhans, which play a role in the desertification process of western Rajasthan, are:
(A) Traditional water harvesting structures
(B) Drought-resistant shrubs
(C) Crescent-shaped shifting sand dunes
(D) Seasonal saline lakes

**113.** The Biological Diversity Act in India was enacted in the year:
(A) 1986
(B) 1992
(C) 2002
(D) 2010

**114.** Which is the most abundant greenhouse gas in the Earth's atmosphere naturally?
(A) Carbon dioxide
(B) Methane
(C) Nitrous oxide
(D) Water vapor

**115.** Match the items in List I with List II:
**List I: (Environmental issue)**
P. Ozone depletion
Q. Acid rain
R. Global warming
S. Eutrophication
**List II: (Key Chemical/Substance)**
1. Phosphates and Nitrates
2. Chlorofluorocarbons (CFCs)
3. Sulfur dioxide
4. Carbon dioxide
Which of the following is the correct matching?
(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-2, R-1, S-4
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-4, R-3, S-1

**116.** 'Black Carbon' is a significant contributor to global warming because it:
(A) Depletes the ozone layer creating ozone holes
(B) Increases the albedo of the Earth's surface
(C) Absorbs solar energy and warms the atmosphere
(D) Causes eutrophication in freshwater lakes

**117.** The transition of a forested ecosystem into a desert-like landscape due to overgrazing is a prime example of:
(A) Desertification
(B) Ecological succession
(C) Eutrophication
(D) Biomagnification

**118.** Which of the following processes removes carbon dioxide from the atmosphere?
(A) Respiration
(B) Combustion of fossil fuels
(C) Volcanic eruptions
(D) Photosynthesis

**119.** A 'Carbon Footprint' is best defined as:
(A) The permanent physical imprint left by unextracted fossil fuels embedded within deep geological strata
(B) Total greenhouse gas emissions generated by human actions
(C) The exact volume of atmospheric carbon sequestered annually by a specific protected forest area
(D) The regulatory quota of permissible carbon emissions assigned to a developing country by the UN

**120.** Which prominent tree, heavily distributed in Rajasthan, is known as the 'Kalpavriksha of the Thar desert' for its immense ecological and socio-economic value?
(A) Teak (Tectona grandis)
(B) Rohida (Tecomella undulata)
(C) Khejri (Prosopis cineraria)
(D) Sal (Shorea robusta)

**121.** The occurrence of 'Fluorosis' in Rajasthan is an environmental health issue primarily associated with:
(A) Air pollution from brick kilns
(B) Soil contamination from pesticides
(C) Noise pollution near airports
(D) Groundwater pollution

**122.** Which among the following ecosystems typically exhibits the highest net primary productivity?
(A) Tropical Rainforest
(B) Arid Subtropical Desert
(C) Deep Marine Open Ocean
(D) High-Latitude Arctic Tundra

Downloaded from www.pdf.tube

(B) Construction of massive reinforced concrete check dams
(C) Afforestation and vegetative barriers
(D) Large-scale application of chemical soil fertilizers

**101.** Solid waste management rules in India emphasize the concept of the 3Rs, which stands for:
(A) Reduce, Reuse, Recycle
(B) Record, Report, Recover
(C) Restore, Replenish, Renew
(D) Regulate, Restrict, Remove

**102.** In the context of atmospheric ozone, what does the term 'Ozone Hole' specifically refer to?
(A) A physical void in the atmosphere where no gases exist
(B) The accumulation of ozone in the troposphere over industrial cities
(C) An area where ozone concentration is artificially increased to cool the planet
(D) A severe depletion of the ozone layer, particularly prominent over Antarctica

**103.** Coliform bacteria are often used as an indicator of which type of environmental pollution?
(A) Toxic heavy metal element contamination in agricultural topsoil
(B) Fecal pollution in water sources
(C) Elevated fine particulate matter concentration levels in urban ambient air
(D) Chronic high-intensity noise pollution surrounding heavy industrial manufacturing zones

**104.** Which of the following acts is considered the umbrella legislation for environmental protection in India?
(A) The Air (Prevention and Control of Pollution) Act, 1981
(B) The Water (Prevention and Control of Pollution) Act, 1974
(C) The Environment (Protection) Act, 1986
(D) The Wildlife (Protection) Act, 1972

**105.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** The use of chemical pesticides in agriculture can lead to the decline of top predator populations.
**Reason (R):** Pesticides undergo biomagnification, increasing in concentration at higher trophic levels.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**106.** The 'Polluter Pays Principle' dictates that:
(A) Polluters must bear the financial cost of environmental damage
(B) Industrial manufacturing facilities must pay heavy flat-rate taxes regardless of actual emission levels
(C) State governments must fully subsidize private manufacturing industries installing pollution abatement systems
(D) Local citizen communities are required to pay dedicated environmental recovery taxes for natural disaster cleanup

**107.** Which international summit is commonly known as the Earth Summit?
(A) Stockholm Conference, 1972
(B) Rio de Janeiro Conference, 1992
(C) Johannesburg Conference, 2002
(D) Copenhagen Summit, 2009

**108.** The term 'Blue Carbon' refers to:
(A) Atmospheric carbon emissions directly generated by commercial maritime shipping and transport operations
(B) Carbon captured by oceanic and coastal ecosystems
(C) Official carbon offset credits purchased and traded exclusively by developing global economies
(D) Microscopic unburned black carbon particles deposited and trapped within high-altitude glacial ice fields

NODIA

**109.** Which of the following is a classic example of an ex-situ conservation method?
(A) Botanical Gardens
(B) National Parks
(C) Wildlife Sanctuaries
(D) Biosphere Reserves

**110.** The textile and dyeing industries in which district of Rajasthan have been a major source of water pollution in the Luni and Bandi rivers?
(A) Bikaner
(B) Jaisalmer

**92.** What is the primary ecological purpose of creating a buffer zone around a strictly protected core area in a biosphere reserve?
(A) To allow major commercial industrial development projects without directly disturbing core wildlife
(B) To allow sustainable human activities compatible with conservation
(C) To strictly prohibit access to all human visitors, local communities, and ecological researchers
(D) To serve as an unrestricted zone for unregulated commercial timber logging and wildlife hunting

**93.** The Mukhyamantri Jal Swavlamban Abhiyan (MJSA) in Rajasthan was primarily launched to:
(A) Achieve village water self-reliance via watershed management
(B) Interlink all major river systems across urban and rural zones of the state
(C) Ensure absolute complete dependence on external canal water systems for farming
(D) Supply free processed bottled drinking water to all urban household residents

**94.** State bird of Rajasthan, the Great Indian Bustard (Godawan), is currently facing a severe threat of extinction primarily due to:
(A) Excessive over-hunting and illegal poaching driven by demand for decorative feathers
(B) Widespread accidental poisoning caused by untreated toxic chemical industrial effluents
(C) Habitat loss and power line collisions in arid zones
(D) Severe global climate change rapidly reducing its primary natural insect food sources

**95.** Consider the following statements regarding the environmental challenges in Rajasthan:
I. The Aravalli range acts as a natural barrier against the eastward expansion of the Thar Desert.
II. Excessive use of groundwater for irrigation has led to fluoride and salinity issues.
III. The state has the highest percentage of dense forest cover in India.
IV. Khejri (Prosopis cineraria) trees play a crucial role in maintaining soil fertility in the desert.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**96.** Fly ash is a major environmental pollutant generated primarily by:
(A) Automobile exhausts
(B) Fertilizer manufacturing plants
(C) Thermal power plants using coal
(D) Agricultural stubble burning

**97.** The concept of 'Sustainable Development' was most prominently defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" by which report?
(A) The Intergovernmental Panel on Climate Change Assessment Report
(B) The Brundtland Commission Report
(C) The official Kyoto Protocol Draft Framework document
(D) The Club of Rome Report on Limits to Growth

**98.** Which of the following correctly describes 'Phytoremediation'?
(A) The specialized biological use of fungi to extract toxic heavy metal ions from aquatic ecosystems
(B) The direct application of synthetic chemical agents to balance and neutralize highly acidic soils
(C) The mechanical removal and physical excavation of polluted topsoil using heavy earthmoving equipment
(D) Using living plants to clean up contaminated environments

**99.** The Khejrali movement in Rajasthan is a historic event associated with:
(A) Bishnoi community sacrifices to protect Khejri trees
(B) Community-led traditional rainwater conservation techniques in historical stepwells
(C) Widespread grassroots protests opposing illegal mechanized sand mining along the Luni river
(D) State-wide conservation programs aimed at saving the endangered Great Indian Bustard

**100.** Which of the following is the most effective natural method for controlling gully erosion in the ravines of the Chambal basin?
(A) Deep intensive mechanized soil plowing techniques

Click Here to Buy book on Flipkart

**123.** The 'Agenda 21' adopted at the Rio Earth Summit is a comprehensive blueprint for:
(A) Eradicating extreme global poverty and hunger across all nations by the early 21st century
(B) Global, national, and local sustainable development
(C) Strictly regulating and monitoring international trade in threatened and endangered wild species
(D) Phasing out non-renewable nuclear weapons and heavy industrial armaments worldwide

**124.** What happens to the biological oxygen demand (BOD) of a river when untreated municipal sewage is discharged into it?
(A) BOD decreases rapidly and steadily
(B) BOD increases sharply
(C) BOD remains completely unaffected
(D) BOD drops instantly to zero

**125.** Consider the following statements regarding the Nitrogen cycle:
I. Nitrogen gas makes up approximately 78% of the Earth's atmosphere.
II. Plants can easily absorb gaseous nitrogen directly from the air through their leaves.
III. Rhizobium bacteria in the root nodules of leguminous plants help in nitrogen fixation.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

**126.** A secondary pollutant is one that:
(A) Demonstrates significantly lower toxicity compared to direct primary atmospheric pollutants
(B) Is released into the lower atmosphere exclusively from mobile urban transport vehicles
(C) Forms in air via chemical reactions of primary pollutants
(D) Acts as the single primary pollutant exclusively responsible for widespread soil degradation

**127.** The Central Pollution Control Board (CPCB) of India monitors ambient air quality. Which size of particulate matter is considered the most dangerous to human health as it can penetrate deep into the lungs and enter the bloodstream?
(A) PM 10
(B) PM 5.0
(C) PM 2.5
(D) PM 50

**128.** 'Ocean Acidification' is a direct consequence of:
(A) Large-scale crude oil spills polluting marine coastal and pelagic oceanic environments
(B) Direct industrial discharge of concentrated sulfur and nitrogen compounds into the oceans
(C) Seawater absorbing excess atmospheric carbon dioxide
(D) Excessive commercial overfishing and harvesting of shell-forming calcifying organisms

**129.** Identify the odd one out in the context of renewable versus non-renewable natural resources:
(A) Solar energy
(B) Coal
(C) Wind energy
(D) Tidal energy

**130.** Consider the following statements about desertification in Rajasthan:
I. Wind erosion is a major factor contributing to the shifting of sand dunes.
II. Over-irrigation in the Indira Gandhi Canal command area has reduced desertification locally but increased soil salinity.
III. The Aravalli range completely blocks all desertification processes toward eastern Rajasthan.
IV. Afforestation using species like Acacia tortilis has been used to stabilize sand dunes.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**131.** The term 'Endemic species' refers to:
(A) Species restricted to a specific geographical area
(B) Broadly adapted species that are universally distributed across all major global continents
(C) Highly threatened species that are critically endangered and preserved exclusively in captive zoos
(D) Foreign exotic species that have recently been introduced into a non-native local habitat

Downloaded from www.pdf.tube

**132.** The process of burning municipal solid waste at high temperatures, which reduces its volume but can release toxic pollutants, is called:
(A) Composting
(B) Landfilling
(C) Incineration
(D) Bioremediation

**133.** Which of the following is a key strategy for climate change adaptation rather than mitigation?
(A) Building infrastructure to adapt to sea level rise
(B) Transitioning national energy grids from coal-fired power plants to solar energy generation
(C) Enforcing mandatory regulatory carbon tax policies on industrial manufacturing facilities
(D) Phasing out global industrial manufacturing and usage of potent hydrofluorocarbons (HFCs)

**134.** Identify the INCORRECT statement regarding the ecological impact of plastics.
(A) Plastics are highly persistent in the environment.
(B) Microplastics have been found in marine organisms and human blood.
(C) Discarded fishing nets contribute to 'ghost fishing' in oceans.
(D) Plastics enrich the soil with essential nutrients as they degrade.

**135.** Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R):
**Assertion (A):** Indoor air pollution can often be more hazardous to human health than outdoor air pollution.
**Reason (R):** The use of biomass fuels for cooking in poorly ventilated spaces leads to high concentrations of harmful particulate matter and carbon monoxide.
Select the correct answer from the options given below:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**136.** The 'Greenhouse Gas Protocol' provides standards for measuring and managing greenhouse gas emissions. In this context, 'Scope 1' emissions refer to:
(A) Indirect emissions from purchased electricity
(B) All indirect emissions in a company's value chain
(C) Direct emissions from owned or controlled sources
(D) Emissions produced by the end consumer of a product

NODIA

**137.** Which state in India became the first to announce a dedicated comprehensive state-level policy on climate change and a State Action Plan directly aligning with the National Action Plan on Climate Change (NAPCC)?
(A) Kerala
(B) Gujarat
(C) Himachal Pradesh
(D) Rajasthan

**138.** E-waste (electronic waste) is particularly hazardous to the environment because it frequently contains heavy metals such as:
(A) Lead, Cadmium, Beryllium
(B) Non-toxic Calcium and Magnesium minerals
(C) Essential Sodium and Potassium element salts
(D) Common structural Iron and Aluminum metal ions

**139.** The depletion of dissolved oxygen in a water body, often leading to a "dead zone", is typically driven by the overabundance of which two nutrients?
(A) Gaseous Carbon and Oxygen compounds
(B) Nitrogen and phosphorus
(C) Mineralized Sulfur and Iron elements
(D) Alkaline Calcium and Magnesium ions

**140.** Which of the following best describes the ecological concept of 'Carrying Capacity'?
(A) The absolute minimum baseline number of interacting biological species required to maintain ecological balance
(B) Maximum population size an environment can indefinitely sustain
(C) The total aggregate biomass weight of all living plant and animal organisms present within a given ecosystem
(D) The maximum atmospheric volume of greenhouse gases an ecosystem can safely absorb without structural degradation

# ANSWERS

**1.** (B) A community of organisms interacting with each other and their physical environment
An ecosystem is a functional and structural unit of ecology where living organisms interact among themselves and with their surrounding physical environment. This complex network includes both biotic factors like plants, animals, and microorganisms, and abiotic components such as air, water, soil, and climate. These elements function together through energy flows and nutrient cycles to maintain dynamic ecological stability.

**2.** (D) Sunlight
Ecosystems consist of both biotic components, which are living organisms, and abiotic components, which are non-living physical and chemical elements. Sunlight is a non-living physical factor that provides the fundamental energy required for driving photosynthesis in autotrophs. In contrast, producers, decomposers, and pathogens are living biological entities that constitute the biotic structural framework of an ecological system.

**3.** (A) To breakdown complex organic matter into simpler inorganic substances
Saprophytes are heterotrophic decomposers, such as fungi and bacteria, that secrete digestive enzymes onto dead plant and animal matter. They break down complex organic compounds into simpler inorganic nutrients like carbon, nitrogen, and phosphorus. This enzymatic decomposition recycles essential nutrients back into the soil and atmosphere, ensuring continuous availability for primary producers and maintaining ecological balance.

**4.** (C) Autotrophs
In terrestrial ecosystems, autotrophs, primarily green plants, occupy the first trophic level because they synthesize their own organic food from inorganic carbon dioxide and water using solar energy via photosynthesis. All subsequent trophic levels, including herbivores, primary carnivores, and secondary carnivores, depend directly or indirectly on the chemical energy produced by autotrophs to sustain their physiological functions.

**5.** (B) II and III only
Stratification refers to the vertical distribution of different species occupying distinct structural levels within an ecosystem, such as canopy trees and shrubs. The standing crop represents the total biomass or mass of living matter present in a given area at a specific time. Both biotic and abiotic components are dynamic rather than static, constantly changing over time.

**6.** (D) A complex network of interconnected food chains within an ecosystem
A food web is a natural, complex network of interconnected food chains that illustrates the multiple feeding relationships among diverse organisms within an ecosystem. Unlike a linear food chain, a food web accounts for organisms feeding on multiple trophic levels, providing alternate pathway routes for energy transfer and enhancing overall ecosystem stability against environmental disruptions.

**7.** (C) 100 Joules
Primary green plants absorb only about one percent of total solar radiation falling on their leaves and convert it into chemical food energy through photosynthesis. Therefore, out of ten thousand Joules of incident solar energy, producers capture approximately one hundred Joules. Subsequent energy transfers between trophic levels follow Lindeman's ten percent law, where ninety percent is lost.

**8.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Energy flow through an ecosystem is strictly unidirectional, moving from solar input to producers and subsequently through consumers. Autotrophs capture radiant solar energy and convert it into chemical energy, which cannot revert back to solar radiation. At each successive trophic level, a significant portion of energy is lost as metabolic heat, resulting in progressive energy reduction.

**9.** (D) Phytoplankton
Phytoplankton are microscopic, photosynthetic autotrophs floating in aquatic ecosystems that serve as the fundamental primary producers. They

Click Here to Buy book on Amazon

**84.** (C) Non-living detritus
Unlike grazing food chains that start with photosynthetic autotrophs, a detritus food chain begins directly with non-living organic matter, known as detritus, such as fallen leaves, dead plant material, and animal excreta. Decomposer microorganisms like fungi and detritivores consume this dead organic substrate, converting it into inorganic nutrients and driving nutrient cycling.

**85.** (D) I, II and III
Primary succession starts on newly exposed bare surfaces lacking pre-existing soil, such as volcanic rock. Secondary succession occurs where an established community was destroyed but fertile soil remains, making it significantly faster than primary succession. The climax community represents the final, stable ecological stage in equilibrium with prevailing regional climate conditions.

**86.** (D) Keystone species
A keystone species plays a uniquely crucial functional role in maintaining the structure, balance, and species diversity of an ecological community. The removal of a keystone species triggers cascading ecological consequences, drastically altering habitat structure and species composition, despite the species often representing a small fraction of total ecosystem biomass or numerical abundance.

**87.** (B) Smoke and fog
The term smog was originally coined in the early twentieth century as a portmanteau combining smoke and fog. It was used to describe dense, dark atmospheric pollution hazes caused by heavy industrial coal burning, where airborne soot and sulfur dioxide particles mixed with natural foggy atmospheric conditions in major urban and industrial centers.

**88.** (C) Sulfur dioxide
Lichens are symbiotic organisms composed of fungi and photosynthetic algae or cyanobacteria. Lacking a protective cuticle and roots, lichens absorb water and nutrients directly from the atmosphere, making them exceptionally sensitive to airborne gaseous pollutants. They suffer severe physiological damage from sulfur dioxide emissions and serve globally as reliable biological indicators of air quality.

**89.** (D) Carbon dioxide
Global Warming Potential is a standardized metric that measures the total heat trapped in the atmosphere by a specific mass of a greenhouse gas relative to the amount of heat trapped by an equivalent mass of carbon dioxide over a specified baseline timeframe, typically one hundred years. Carbon dioxide serves as the reference gas with a baseline value of one.

NODIA

**90.** (A) Catalytic converters
Catalytic converters are exhaust emissions control devices installed in motor vehicles to convert toxic gaseous pollutants like carbon monoxide, hydrocarbons, and nitrogen oxides into less harmful gases. They do not remove solid particulate matter from industrial smokestacks, whereas electrostatic precipitators, fabric filters, and wet scrubbers are specialized industrial equipment for particulate control.

**91.** (B) Salinization
Soil salinization is the process by which water-soluble salts accumulate within the upper soil profile, severely inhibiting plant root water absorption and reducing crop productivity. In arid regions like Rajasthan, high evaporation rates, poor drainage, and excessive irrigation using saline groundwater pull subterranean salts upward through capillary action, causing progressive land degradation.

**92.** (B) To allow sustainable human activities compatible with conservation
In a biosphere reserve, the buffer zone surrounds the strictly protected core area. The primary ecological purpose of the buffer zone is to accommodate controlled, sustainable human activities such as scientific research, environmental education, ecotourism, and low-impact traditional resource use, creating a protective transition area that reduces human encroachment on core wildlife populations.

**93.** (A) Achieve village water self-reliance via watershed management
The Mukhyamantri Jal Swavlamban Abhiyan was launched in Rajasthan as a flagship community-driven water conservation campaign. Its primary objective is to make rural villages self-reliant in water availability by constructing watershed structures, rejuvenating traditional water harvesting bodies, recharging groundwater aquifers, and promoting sustainable soil and

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

as asphalt, forests, and ocean waters absorb majority of solar energy, possessing much lower albedo values.

**19.** (B) Producers → Herbivores → Primary Carnivores → Secondary Carnivores
A standard grazing food chain begins with autotrophic producers that synthesize organic matter through photosynthesis. Herbivores occupy the second trophic level by consuming producers. Primary carnivores feed on herbivores at the third level, followed by secondary carnivores occupying higher levels. This sequential progression maintains the structured directional flow of chemical energy and nutrients through ecological food chains.

**20.** (C) Thermal stress due to elevated ocean temperatures
Coral bleaching primarily occurs when elevated ocean temperatures subject marine coral polyps to severe thermal stress. Under thermal stress, corals expel their endosymbiotic photosynthetic algae, zooxanthellae, which reside within their tissues and provide essential nutrients and pigmentation. Deprived of these algae, coral skeletons become starkly white, leading to starvation, vulnerability, and potential reef death.

**21.** (A) Nitrogen ($N_2$)
Molecular nitrogen comprises approximately seventy-eight percent of Earth atmosphere but lacks the molecular structure required to absorb thermal infrared radiation, making it a non-greenhouse gas. In contrast, greenhouse gases like carbon dioxide, methane, and nitrous oxide possess polyatomic structures capable of absorbing and re-emitting outgoing thermal radiation, thereby contributing directly to atmospheric heat retention.

**22.** (D) Methane
Methane is a potent greenhouse gas produced predominantly through anaerobic decomposition of organic material. Submerged waterlogged soils in paddy fields generate ideal conditions for methanogenic archaea to produce methane. Additionally, enteric fermentation within the digestive tracts of ruminant animals like cattle releases significant quantities of methane into the atmosphere, contributing noticeably to global anthropogenic warming.

**23.** (A) 1, 2, 3, 4
Among anthropogenic greenhouse gases, carbon dioxide makes the highest percentage contribution to global greenhouse warming due to massive emission volumes. Methane ranks second in overall warming contribution, followed by chlorofluorocarbons, and then nitrous oxide. Arranging these atmospheric trace gases according to their relative percentage contributions yields the precise sequence of carbon dioxide, methane, chlorofluorocarbons, and nitrous oxide.

**24.** (C) Solar Ultraviolet-B (UV-B) radiation
Stratospheric ozone acts as a protective planet shield by absorbing high-energy solar Ultraviolet-B radiation before it reaches the surface. Exposure to unattenuated UV-B radiation causes severe biological damage in humans, including skin cancers, cataracts, and immune suppression, while harming marine plankton and terrestrial crop productivity. Stratospheric ozone prevents these harmful biological impacts effectively.

**25.** (D) Chlorine
Solar ultraviolet radiation breaks down chlorofluorocarbon molecules in the stratosphere, releasing free chlorine radicals. A single chlorine atom acts as an efficient catalyst, reacting with ozone molecules to form chlorine monoxide and oxygen without being consumed. Through this catalytic cycle, one reactive chlorine atom can destroy thousands of ozone molecules, leading to significant stratospheric ozone depletion.

**26.** (A) Dobson Units (DU)
The total concentration and thickness of the stratospheric ozone layer is measured in Dobson Units. One Dobson Unit represents a layer of pure ozone that would be one-hundredth of a millimeter thick under standard atmospheric temperature and pressure conditions. Normal stratospheric ozone levels typically measure around three hundred Dobson Units across global atmospheric columns.

**27.** (C) I and III only
Primary pollutants are hazardous substances emitted directly into the atmosphere from identifiable sources like smoke stacks or vehicle exhausts. Tropospheric ozone is a secondary pollutant formed via complex atmospheric photochemical reactions between nitrogen oxides and volatile organic compounds in sunlight.

Downloaded from www.pdf.tube

**65.** (D) I, II and III
Wetlands perform critical ecological services. They act as natural sponges that retain excess stormwater to mitigate flooding, trap sediment and neutralize toxic water pollutants to enhance water quality, and provide essential habitats, breeding grounds, and feeding stops for diverse resident and migratory bird populations. Therefore, all listed statements accurately describe vital wetland functions.

**66.** (D) Wetlands
The Ramsar Convention is an intergovernmental environmental treaty adopted in 1971 in Ramsar, Iran. The treaty provides a national framework and international cooperation for the conservation, management, and wise sustainable use of wetlands and their natural resources worldwide, recognizing the fundamental ecological functions and immense economic, cultural, and scientific value of wetland ecosystems.

**67.** (A) Keoladeo National Park and Sambhar Lake
Rajasthan hosts two designated Ramsar sites of international importance: Keoladeo National Park in Bharatpur and Sambhar Lake near Jaipur. Keoladeo is a famous wetland sanctuary providing wintering habitat for waterfowl, while Sambhar Lake is India largest inland saline lake supporting large populations of migratory birds including flamingos.

**68.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Wetlands are frequently called the kidneys of the landscape because they filter sediments, decompose organic waste, and remove excessive nutrients and toxic heavy metals from water flowing through them. This biological purification function operates similarly to physical waste filtering in living kidney organs, making the statement and its underlying functional reason completely correct and explanatory.

**69.** (A) Sambhar Lake
Sambhar Lake in Rajasthan experienced a major ecological crisis when tens of thousands of migratory birds died from avian botulism. Avian botulism is a paralytic disease caused by ingesting botulinum neurotoxin produced by the anaerobic bacterium Clostridium botulinum. Hypersaline conditions, warm water temperatures, and decaying organic matter accelerated bacterial growth and toxin production.

**70.** (D) Keoladeo National Park
The Montreux Record is a register under the Ramsar Convention listing wetland sites facing ecological degradation due to technological developments, pollution, or human interference. Keoladeo National Park in Rajasthan was placed on the Montreux Record owing to severe water scarcity issues and invasive weed growth. Sambhar Lake is a Ramsar site but not on Montreux.

**71.** (B) Reducing the emission of greenhouse gases to tackle the root cause
In climate change strategy, mitigation focuses on interventions designed to reduce greenhouse gas emissions or enhance atmospheric carbon sinks, thereby addressing the root cause of global climate change. In contrast, adaptation involves adjusting physical infrastructure, agricultural practices, and societal systems to minimize vulnerability and cope with the unavoidable impacts of climate change.

**72.** (A) 2, 4, 1, 5, 3
India National Air Quality Index categorizes air quality into six distinct bands based on pollutant concentrations. Arranged in order of increasing severity and health impact, the categories progress from Good to Satisfactory, Moderate, Poor, Very Poor, and Severe. Thus, the numerical sequence corresponding to Good, Satisfactory, Moderate, Poor, and Severe is 2, 4, 1, 5, 3.

**73.** (C) 2006
The National Environment Policy of India was formally approved and adopted by the Union Cabinet in 2006. Building upon earlier environmental enactments, the policy provides a comprehensive national strategy aimed at integrating environmental conservation commitments into mainstream economic development processes while ensuring sustainable resource management, equity, and environmental governance across all sectors nationwide.

**74.** (A) Carbon dioxide
India National Air Quality Index monitors eight specific air pollutants: particulate matter PM10 and PM2.5, nitrogen dioxide, sulfur dioxide, carbon monoxide, ground-level ozone, ammonia, and lead. Although carbon dioxide is a primary greenhouse gas driving global climate change,

NODIA

**37.** (A) Decibels
Noise pollution, defined as unwanted or harmful sound, is standardly measured in decibels. The decibel scale is a logarithmic scale that quantifies sound pressure levels relative to a reference threshold of human hearing. Because human hearing covers a wide range of sound intensities, the logarithmic decibel metric allows convenient representation of acoustic pressure levels.

**38.** (B) I, II and IV
Prolonged exposure to high-intensity noise pollution causes auditory fatigue, permanent hearing loss, physiological stress, elevated blood pressure, and cardiovascular disease. Chronic acoustic disturbance also impairs sleep quality and causes psychological distress. Rather than enhancing productivity, continuous exposure to excessive noise significantly impairs cognitive focus, learning performance, and overall task efficiency in humans.

**39.** (C) 55 dB(A)
Under the Noise Pollution Regulation and Control Rules in India, specific ambient air quality standards are mandated for different functional zones. For residential areas, the maximum permissible ambient sound limit during daytime hours is 55 dB(A) Leq. Maintaining these regulatory noise thresholds helps protect urban communities from the harmful health impacts of noise pollution.

**40.** (C) Reducing the dissolved oxygen holding capacity of warm water
Thermal pollution occurs when industrial facilities release heated effluent water directly into natural aquatic ecosystems. Raising water temperatures significantly decreases the physical solubility and holding capacity of dissolved oxygen in water. Concurrently, elevated temperatures increase the metabolic rates of aquatic organisms, creating severe respiratory distress and hypoxia that threaten fish and biota survival.

**41.** (D) Agricultural expansion and livestock grazing
Large-scale agricultural expansion and livestock grazing constitute the single primary driver of deforestation globally. Substantial forest areas are continuously cleared, burned, or converted into cropland for commercial agriculture and pastures for cattle farming. While urbanization, mining, and forest fires contribute locally, agricultural land conversion remains the dominant global factor reducing forest cover worldwide.

**42.** (B) Splash erosion → Sheet erosion → Rill erosion → Gully erosion
Soil erosion by water progresses through four distinct sequential stages based on increasing severity. Raindrops first loosen soil particles during splash erosion. Uniform thin layers of topsoil are then washed away during sheet erosion. Flowing surface water subsequently carves small channels called rills, which eventually deepen and widen into massive, destructive gullies.

**43.** (B) Central Arid Zone Research Institute (CAZRI)
The Central Arid Zone Research Institute is a premier multidisciplinary research institute headquartered in Jodhpur, Rajasthan. Established under the Indian Council of Agricultural Research, CAZRI conducts specialized scientific research on arid lands, desertification processes, soil and water conservation, sustainable farming systems, and vegetation management to restore degraded dryland ecosystems.

**44.** (B) Desertification
Desertification is the degradation of land in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and unsustainable human activities. Processes such as deforestation, overgrazing, over-cultivation, and poor irrigation management strip fertile topsoil, drastically reducing biological productivity and transforming previously arable land into unproductive, desert-like conditions over time.

**45.** (C) I and III only
Acid rain is formed when industrial atmospheric emissions of sulfur dioxide and nitrogen oxides react with water vapor to form sulfuric and nitric acids. Acid rain lowers, rather than increases, the pH of soil and aquatic bodies, making them overly acidic. Acidic precipitation also accelerates chemical weathering and corrosion of building materials, stone monuments, and infrastructure.

**46.** (C) 5.6
Unpolluted rainwater naturally has a slightly acidic pH of about 5.6 because atmospheric carbon dioxide dissolves in moisture to form weak carbonic acid. Rainwater with a pH value below 5.6 is classified as acid rain, indicating the presence of stronger mineral acids, primarily

Click Here to Buy book on Flipkart

Photochemical smog is also a secondary pollutant formed through subsequent chemical transformations of primary pollutants.

**28.** (B) Tropospheric ozone, peroxyacetyl nitrate, and nitrogen oxides
Photochemical smog is a modern hazardous air pollution complex formed when sunlight drives reactions between primary emissions like nitrogen oxides and volatile organic compounds. Its primary toxic constituents include tropospheric ozone, peroxyacetyl nitrate, aldehydes, and nitrogen dioxide. This brownish atmospheric haze causes respiratory irritation, reduces visibility, and damages plant vegetation across urban regions.

**29.** (B) 2.5 micrometers
PM 2.5 denotes fine particulate matter suspended in the atmosphere with an aerodynamic diameter of less than 2.5 micrometers, or microns. Because of their minute size, these fine particles remain airborne for extended periods and can easily bypass human upper respiratory filter systems, penetrating deeply into lungs and blood vessels to cause serious cardiorespiratory disorders.

**30.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Ground-level tropospheric ozone is a highly reactive secondary pollutant and powerful oxidant that inflicts severe damage on biological tissues. It damages plant foliage, reduces photosynthetic capacity, and impairs human lung function. Because tropospheric ozone is a strong oxidant forming a major toxic component of photochemical smog, its oxidising power directly explains its environmental toxicity.

**31.** (D) Oxygen required by bacteria to degrade organic matter in water
Biochemical Oxygen Demand measures the total amount of dissolved oxygen consumed by aerobic microorganisms to biologically decompose organic matter present in a water sample over a specific time and temperature. Higher BOD values signify heavy organic pollution loads, indicating that microbial decomposition is rapidly consuming dissolved oxygen required by fish and aquatic species.

**32.** (C) Mercury
Minamata disease is a severe neurological syndrome caused by chronic methylmercury poisoning. It was first identified in Minamata City, Japan, where industrial wastewater containing inorganic mercury was discharged into the bay. Bioaccumulation and biomagnification of methylmercury through marine food chains led to severe toxicity in humans who consumed contaminated local fish and shellfish.

NODIA

**33.** (B) Fluoride
Elevated concentrations of natural fluoride ions in groundwater occur across several arid and semi-arid districts in Rajasthan due to the weathering of fluoride-bearing rocks. Long-term consumption of high-fluoride drinking water causes severe fluorosis, characterized by mottling and discoloration of tooth enamel alongside painful crippling skeletal deformities and joint stiffness in human populations.

**34.** (A) P-2, Q-3, R-1, S-4
Nitrate toxicity in infants causes methemoglobinemia, or Blue Baby Syndrome, by reducing blood oxygen capacity. Cadmium ingestion leads to painful Itai-Itai disease affecting bones and kidneys. Excessive fluoride consumption causes dental and skeletal fluorosis. Inhaling asbestos fibers induces severe pulmonary fibrosis known as asbestosis. Matching these pollutant-disease pairs establishes the precise sequence.

**35.** (A) Monoculture farming effectively preserves overall soil nutrient diversity.
Continuous monoculture farming severely depletes specific soil nutrients over time because cultivating the same crop repeatedly continuously extracts identical nutrient profiles from the topsoil. This practice degrades overall soil health and biodiversity, requiring synthetic fertilizers. Deforestation, chemical fertilizer overuse, and excessive irrigation in arid lands also drive major soil degradation processes such as erosion and salinization.

**36.** (C) Bioremediation
Bioremediation is an eco-friendly environmental biotechnology that utilizes living microorganisms, such as bacteria and fungi, to metabolize, detoxify, or degrade environmental pollutants in soil, sludge, or water. Microbes break down hazardous organic contaminants into harmless inorganic end-products like carbon dioxide and water, effectively restoring polluted habitats to clean ecological conditions.

**56.** (B) 2010
The National Green Tribunal was established in India in 2010 under the National Green Tribunal Act. Created as a specialized judicial body equipped with environmental expertise, the tribunal handles cases involving environmental protection, conservation of forests and natural resources, and legal enforcement of environmental rights, ensuring rapid disposal of environmental disputes within six months.

**57.** (D) The Wildlife (Protection) Act, 1972
The National Green Tribunal has civil jurisdiction over environmental matters arising under seven specified environmental statutes listed in Schedule I of its enabling act. While statutes regulating water pollution, forest conservation, and environmental protection fall under NGT jurisdiction, the Wildlife Protection Act of 1972 is explicitly excluded from the civil jurisdiction of the tribunal.

**58.** (C) I, II and IV
Environmental Impact Assessment involves screening to determine project evaluation requirements, scoping to define critical impact boundaries, and appraisal where regulatory authorities evaluate reports to decide on environmental clearance. Public consultation is a mandatory component for Category A developmental projects to collect local stakeholder feedback, making claims of it being completely optional entirely incorrect.

**59.** (B) To document baseline environmental conditions before project commencement
Baseline data collection in Environmental Impact Assessment involves systematic monitoring and documentation of the pre-existing environmental state of a project site prior to development. Gathering baseline parameters regarding air quality, water resources, soil characteristics, flora, and fauna enables accurate prediction, measurement, and monitoring of potential environmental changes caused by proposed industrial activities.

**60.** (B) Category A
Under the Environmental Impact Assessment Notification in India, developmental projects are categorized based on spatial extent and potential impacts. Category A projects require mandatory prior environmental clearance from the Central Ministry of Environment, Forest and Climate Change. Category B projects are appraised at the state level, with Category $B_1$ requiring an EIA and Category $B_2$ being exempt.

**61.** (C) SDG 13
Sustainable Development Goal 13 of the United Nations 2030 Agenda specifically urges immediate and coordinated global action to combat climate change and its severe environmental impacts. SDG 13 framework focuses on strengthening climate resilience, integrating climate measures into national policies, enhancing public education on mitigation, and fulfilling global commitments regarding international climate financing mechanisms.

**62.** (A) Nitrogen Fixation → Nitrification → Assimilation → Ammonification → Denitrification
The nitrogen cycle follows a distinct biochemical sequence. Atmospheric nitrogen is first fixed into ammonia by bacteria during nitrogen fixation. Soil nitrifying bacteria convert ammonia into nitrites and nitrates through nitrification. Plants absorb these nitrates during assimilation. Decomposers convert organic nitrogen into ammonia via ammonification, and denitrifying bacteria ultimately convert nitrates back into nitrogen gas.

**63.** (D) The oceans
Earth oceans represent the largest active global carbon sink, holding vastly more dissolved carbon than the atmosphere, terrestrial biosphere, and soil combined. Oceans absorb carbon dioxide directly through physical gas dissolution at the sea surface and via biological carbon pumps driven by marine phytoplankton photosynthesis, storing carbon across deep oceanic waters and marine sediments.

**64.** (C) It does not have a significant atmospheric gaseous phase.
The phosphorus cycle is classified as a sedimentary nutrient cycle because phosphorus exists primarily in solid form within rocks, minerals, and soil deposits, lacking a significant gaseous atmospheric phase. Unlike carbon and nitrogen cycles that circulate extensively through atmospheric gases, phosphorus moves slowly via geological weathering, surface runoff, soil absorption, and biological assimilation.

NODIA

synthesize organic compounds from dissolved carbon dioxide and solar energy, forming the foundation of the aquatic food web. Zooplankton, small fishes, and benthic scavengers rely directly or indirectly on phytoplankton production for energy transfer across higher trophic levels.

**10.** (A) Pyramid of Energy
A pyramid of energy represents the rate of energy flow across successive trophic levels over time and is always upright. Due to the second law of thermodynamics, energy is continuously lost as metabolic heat at each trophic step, ensuring that energy available at a higher level is always less than at the preceding base level without exception.

**11.** (B) Agricultural field
An agricultural field is an artificial or man-made ecosystem created, maintained, and managed by human intervention. Unlike natural ecosystems such as tropical rainforests, coral reefs, and estuaries, agricultural ecosystems feature low species diversity, curated crop monocultures, controlled nutrient inputs like fertilizers, and continuous human management to optimize specific agricultural crop yields and productivity.

**12.** (A) P-4, Q-2, R-1, S-3
Grasslands represent terrestrial ecosystems located on land. Lotic ecosystems consist of flowing freshwaters like rivers, whereas lentic ecosystems comprise standing or still freshwaters such as ponds. Aquariums are artificial, human-engineered ecosystems. Matching these pairs accurately aligns grasslands to terrestrial, rivers to lotic, ponds to lentic, and aquariums to artificial structural categories within ecological classifications.

**13.** (A) Habitat destruction and fragmentation
Habitat destruction and fragmentation caused by human activities like urban expansion, deforestation, and industrialization represent the single most critical driver of global ecological imbalance and biodiversity loss. Disrupting natural habitats isolates biological populations, limits genetic exchange, alters trophic interactions, reduces ecosystem resilience, and accelerates species extinction rates far beyond natural baseline background levels globally.

**14.** (C) Eutrophication
Eutrophication is the ecological process occurring when excess nutrients, primarily nitrogen and phosphorus from agricultural runoff and sewage, enter aquatic ecosystems. This nutrient enrichment triggers rapid algal blooms. As dense algae die, aerobic decomposers multiply rapidly and consume vast amounts of dissolved oxygen, leading to hypoxic or anoxic conditions that cause widespread mortality among fish and organisms.

**15.** (D) Long-term shifts in global or regional climate patterns
Climate change refers to long-term, significant shifts in global or regional weather patterns, including persistent alterations in average temperatures, precipitation trends, and atmospheric circulation. While weather represents short-term daily atmospheric variations, climate change reflects systemic alterations over decades or centuries driven by both natural planetary dynamics and anthropogenic greenhouse gas emissions into the Earth atmosphere.

**16.** (C) The trapping of the sun's warmth in the lower atmosphere by certain gases
The greenhouse effect is a natural planetary phenomenon where specific atmospheric gases, such as water vapor, carbon dioxide, and methane, trap outgoing longwave thermal infrared radiation emitted by the Earth. By preventing heat from escaping into outer space, this process maintains global surface temperatures at a level capable of supporting life and liquid ocean water.

**17.** (B) I, II and IV
Global warming causes thermal expansion of oceans and rapid melting of polar ice caps and glaciers, leading to rising global sea levels. Increased global temperatures also trigger shifts in species geographical distributions and habitats. However, global warming increases, rather than decreases, the frequency and severity of extreme weather events such as intense heatwaves, droughts, and storms.

**18.** (D) Fresh snow
Albedo measures the reflectivity of a surface regarding incoming solar radiation, expressed as a fraction or percentage. Fresh snow exhibits an exceptionally high albedo of up to ninety percent, reflecting most incoming sunlight back into space. Conversely, dark surfaces such

Downloaded from www.pdf.tube

it is not monitored as a localized air pollutant within the standard National AQI framework.

**75.** (A) P-2, Q-4, R-1, S-3
Carbon sequestration refers to long-term atmospheric carbon capture and storage. Bioaccumulation involves the gradual accumulation of toxic substances within individual organisms over time. Biomagnification describes the increasing concentration of persistent toxins up successive trophic levels in food chains. Endemism indicates species naturally restricted to specific geographic areas. The correct sequence matching these pairs is P-2, Q-4, R-1, S-3.

**76.** (B) Illegal mining and excessive quarrying activities
The severe depletion of forest cover across the ancient Aravalli range in Rajasthan is primarily attributed to uncontrolled illegal mining and excessive stone quarrying. Extractive mining operations strip dense hill vegetation, degrade topsoil, destroy wildlife habitats, lower groundwater tables, and create major gaps in the natural ecological barrier that prevents desert spread toward eastern Rajasthan.

**77.** (A) Groundwater extraction exceeds the annual rate of groundwater recharge.
In groundwater management terminology in Rajasthan, Dark Zones refer to designated geographic blocks where annual extraction of groundwater for agricultural, industrial, and domestic usage severely exceeds natural annual groundwater recharge rates. Over-exploitation in these over-exploited blocks causes deep depletion of water tables, dried wells, deteriorating water quality, and critical regional water security threats.

**78.** (B) I, III and IV
Microplastics are synthetic plastic particles smaller than five millimeters. Open burning of plastic waste releases toxic pollutants including dioxins into the air, while single-use plastics compose a major share of terrestrial and marine waste. Plastics are highly persistent and non-biodegradable rather than rapidly degradable, making claims of quick marine breakdown false.

**79.** (B) 1st July 2022
The Ministry of Environment, Forest and Climate Change, Government of India, enforced a nationwide ban on identified single-use plastic items with low utility and high littering potential starting 1st July 2022. The regulatory ban prohibits the manufacture, import, stocking, distribution, sale, and usage of items such as plastic cutlery, straws, and polystyrene products.

**80.** (C) Persist in ecosystems and bioaccumulate in animal fatty tissues
Persistent Organic Pollutants are toxic synthetic chemical substances that resist chemical, biological, and photolytic degradation in natural environments. Because of their high lipid solubility, POPs persist for extended periods, bioaccumulate in animal fatty tissues, and biomagnify through ecological food webs, posing severe long-term health risks including reproductive impairment and toxicity in humans and wildlife.

**81.** (B) Tundra
The tundra biome is characterized by extremely cold atmospheric temperatures, low annual precipitation, dwarf vegetation, and a permanently frozen subsoil layer known as permafrost. The presence of permafrost prevents deep root penetration, limiting plant growth mainly to mosses, lichens, and low shrubs during a very brief summer growing season lasting only a few weeks.

NODIA

**82.** (C) I and III only
Evaporation from water surfaces and transpiration from plant foliage transfer water vapor into the atmosphere, while condensation transforms vapor into water droplets forming clouds. Precipitation returns atmospheric water to land, but runoff, rivers, and groundwater discharge are primary mechanisms moving land water to oceans, making claims that precipitation is the sole transport mechanism incorrect.

**83.** (A) Ecotone
An ecotone is a dynamic transition zone between two adjacent, distinct biological communities or ecosystems, such as the boundary between forest and grassland. Ecotones often feature environmental conditions from both overlapping ecosystems, exhibiting unique species compositions and higher biodiversity and population densities, a phenomenon known ecologically as the edge effect.

sulfuric acid and nitric acid derived from industrial pollution emissions.

**47.** (D) Acid rain
Stone cancer refers to the chemical deterioration of historical marble and limestone monuments caused by acid rain. Industrial atmospheric pollutants like sulfur dioxide react with moisture to form sulfuric acid precipitation. When this acidic rain falls on monuments like the Taj Mahal, it reacts chemically with calcium carbonate in marble, creating soluble calcium sulfate that corrodes the stone surface.

**48.** (C) Reduce wind erosion and check sand dune movement
In arid regions like Rajasthan, shelterbelts consist of dense rows of trees and shrubs planted perpendicular to the prevailing wind direction. These vegetative barriers slow wind velocity, significantly reducing wind erosion of topsoil and preventing the shifting of mobile sand dunes onto agricultural fields, infrastructure, and human settlements across hyper-arid landscapes.

**49.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Deforestation significantly alters regional hydrologic cycles and climate patterns. Trees absorb ground moisture and release large quantities of water vapor into the atmosphere through transpiration, which fuels cloud formation and regional precipitation. Consequently, widespread forest removal decreases atmospheric humidity and local evapotranspiration rates, directly causing a marked reduction in overall regional rainfall.

**50.** (D) Waterlogging and soil salinization
Intensive canal irrigation via the Indira Gandhi Canal in western Rajasthan has introduced vast quantities of water to hyper-arid soils without adequate drainage systems. Over-irrigation has caused groundwater tables to rise close to the surface, triggering severe waterlogging. Subsequent evaporation of standing water leaves concentrated mineral salts behind, causing severe soil salinization in command areas.

**51.** (B) 2.0°C above pre-industrial levels, pursuing 1.5°C
The Paris Agreement is a legally binding international treaty on climate change adopted in 2015. Its primary goal is to hold the increase in global average temperature to well below 2.0 degrees Celsius above pre-industrial levels, while pursuing active efforts to limit the temperature increase to 1.5 degrees Celsius to significantly reduce climate risks and impacts.

**52.** (A) 3, 2, 1, 4
The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in 1987. The Kyoto Protocol addressing greenhouse gas reductions was adopted in 1997. The Paris Agreement governing global climate action was adopted in 2015. The Kigali Amendment to phase down hydrofluorocarbons was adopted in 2016. Chronologically, the correct historical order is 3, 2, 1, 4.

**53.** (D) All of the above have a COP structure
The Conference of the Parties serves as the supreme decision-making body for major international environmental conventions. The United Nations Framework Convention on Climate Change, the Convention on Biological Diversity, and the United Nations Convention to Combat Desertification all utilize a COP structure to review implementation, negotiate policies, and adopt binding global environmental resolutions.

**54.** (D) Kyoto Protocol
The concept of carbon credits and flexible market-based emissions mechanisms originated under the 1997 Kyoto Protocol. Through mechanisms such as the Clean Development Mechanism, Joint Implementation, and emissions trading, the protocol enabled industrialized countries to meet their legally binding emission reduction targets by purchasing tradable carbon credits generated from verified greenhouse gas mitigation projects worldwide.

**55.** (A) P-2, Q-1, R-4, S-3
The Montreal Protocol focuses on phasing out ozone-depleting substances. The Basel Convention regulates the transboundary movement and disposal of hazardous wastes. The Stockholm Convention aims to eliminate or restrict persistent organic pollutants. The UNFCCC provides the framework for stabilizing atmospheric greenhouse gas concentrations. Matching these treaties with their objectives produces the correct sequence.

Click Here to Buy book on Amazon

moisture conservation practices across drought-prone rural landscapes.

**94.** (C) Habitat loss and power line collisions in arid zones
The Great Indian Bustard, the state bird of Rajasthan, faces severe extinction risks primarily due to extreme habitat degradation and collisions with high-voltage power transmission lines traversing its dry grassland habitats. Low reproductive rates, agricultural land conversion, and overhead power line infrastructure have critically depleted wild populations, placing the species in the critically endangered category.

**95.** (B) I, II and IV
The Aravalli range serves as a natural barrier checking western desert expansion, while excessive groundwater extraction has escalated fluoride contamination and soil salinity in Rajasthan. The Khejri tree enhances desert soil fertility through nitrogen fixation. However, Rajasthan possesses low forest cover rather than the highest percentage of dense forest cover in India.

**96.** (C) Thermal power plants using coal
Fly ash is a fine particulate environmental pollutant generated primarily during the combustion of pulverized coal in thermal power stations. Discharged through flue gases, fly ash contains heavy metals and toxic oxides. Improper management pollutes air and water sources, although captured fly ash is increasingly reused as a sustainable ingredient in cement manufacturing and construction materials.

**97.** (B) The Brundtland Commission Report
Sustainable development was famously defined in the landmark 1987 report entitled "Our Common Future," published by the World Commission on Environment and Development, commonly known as the Brundtland Commission. The report defined it as development meeting present needs without compromising the ability of future generations to meet their own needs, establishing modern global sustainability framework principles.

**98.** (D) Using living plants to clean up contaminated environments
Phytoremediation is a sustainable, plant-based environmental technology that utilizes living plants and associated root microorganisms to absorb, accumulate, neutralize, or degrade pollutants from contaminated soil, surface water, or groundwater. Selected plant species extract heavy metals, pesticides, radioactive elements, and organic pollutants through specialized mechanisms like phytoextraction, rhizofiltration, and phytodegradation.

NQDIA

**99.** (A) Bishnoi community sacrifices to protect Khejri trees
The Khejrali movement occurred in 1730 in Khejrali village, Rajasthan, where 363 members of the Bishnoi community, led by Amrita Devi, sacrificed their lives to protect sacred Khejri trees from being felled by royal soldiers. This historic environmental conservation sacrifice inspired modern eco-preservation movements, highlighting the deep cultural and ecological commitment of the Bishnoi community.

**100.** (C) Afforestation and vegetative barriers
Afforestation and establishing vegetative barriers represent the most sustainable and effective natural methods to control gully erosion in the Chambal ravines. Tree roots anchor fragile topsoil, improve soil structure, and increase water infiltration, while vegetative cover slows surface runoff velocities, preventing further deepening and widening of gully channels across eroded ravine landscapes.

**101.** (A) Reduce, Reuse, Recycle
The 3Rs rule in solid waste management represents the core hierarchy for sustainable waste handling: Reduce, Reuse, and Recycle. This principle prioritizes minimizing waste generation at the source, reusing items multiple times before disposal, and processing discarded recyclable materials into raw inputs for new products, thereby conserving natural resources and reducing environmental pollution.

**102.** (D) A severe depletion of the ozone layer, particularly prominent over Antarctica
The term ozone hole describes a localized area of severe atmospheric ozone depletion in the stratospheric ozone layer, occurring seasonally over Antarctica. Caused by anthropogenic emissions of ozone-depleting substances like chlorofluorocarbons, this thinning drastically reduces the stratospheric concentration of ozone molecules, allowing elevated levels of harmful ultraviolet radiation to reach the surface.

(B) Trade in their body parts
(C) Capturing for commercial exhibition
(D) All of the above

**27.** Which of the following is an exception and does NOT fall under the category of a non-renewable energy resource?
(A) Coal
(B) Biogas
(C) Natural Gas
(D) Uranium

**28.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Wildlife (Protection) Act prohibits the destruction of any wildlife habitat within a National Park.
**Reason (R):** National Parks are strictly reserved for the betterment of wildlife, and human activities like grazing and forestry are completely prohibited.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**29.** The concept of "Maximum Sustainable Yield" in resource management is most closely associated with the utilization of which type of resource?
(A) Renewable biological resources
(B) Non-renewable mineral and ore deposits
(C) Depletable underground fossil fuel reserves
(D) Inexhaustible solar and wind energy potential

**30.** What is the primary objective of declaring a specific area as a "Biosphere Reserve" under the Man and the Biosphere (MAB) Programme?
(A) To provide exclusive territorial protection for large terrestrial predatory mammalian species.
(B) To completely isolate the entire natural ecosystem from all forms of human presence and socio-economic activities.
(C) To integrate biodiversity conservation with sustainable development.
(D) To serve primarily as an international commercial tourist destination for extreme adventure sports activities.

**31.** A Biosphere Reserve is typically divided into three zones. Which zone is legally protected and prohibits all human activities except non-destructive research?
(A) Buffer Zone
(B) Transition Zone
(C) Restoration Zone
(D) Core Zone

**32.** Consider the following statements comparing National Parks and Wildlife Sanctuaries in India:
I. Both are declared under the Wildlife (Protection) Act, 1972.
II. Grazing of livestock is strictly prohibited in a National Park but may be permitted in a Sanctuary.
III. A National Park can be downgraded to a Sanctuary, but a Sanctuary cannot be upgraded to a National Park.
IV. Private land ownership rights may be allowed within a Sanctuary but are strictly extinguished in a National Park.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

**33.** Which of the following is the first National Park established in India?
(A) Kanha National Park
(B) Jim Corbett National Park
(C) Kaziranga National Park
(D) Gir National Park

**34.** Match List I with List II and select the correct option.
**List I: (Protected Area in Rajasthan)**
P. Desert National Park
Q. Mukundra Hills Tiger Reserve
R. Keoladeo National Park
S. Ranthambore National Park
**List II: (District)**
1. Sawai Madhopur
2. Bharatpur
3. Jaisalmer and Barmer
4. Kota and Chittorgarh
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-1, R-2, S-4
(C) P-2, Q-4, R-3, S-1
(D) P-3, Q-4, R-2, S-1

**35.** Keoladeo National Park in Rajasthan is internationally recognized for its avifauna. Under

Downloaded from www.pdf.tube

**112.** (C) Crescent-shaped shifting sand dunes
Barkhans are distinct crescent-shaped mobile sand dunes common in hyper-arid regions like the Thar Desert in western Rajasthan. Formed by strong unidirectional wind currents, barkhans possess convex windward slopes and steep slip faces. As prevailing winds blow continuously, barkhans migrate steadily across desert terrain, contributing to wind erosion and advancing localized desertification processes.

**113.** (C) 2002
The Biological Diversity Act in India was enacted in 2002 to fulfill national commitments under the United Nations Convention on Biological Diversity. The legislation establishes a three-tiered institutional structure—National Biodiversity Authority, State Biodiversity Boards, and local Biodiversity Management Committees—to regulate access to biological resources, ensure sustainable utilization, and facilitate fair benefit-sharing.

**114.** (D) Water vapor
Water vapor is naturally the most abundant greenhouse gas in Earth atmosphere, generating the largest natural greenhouse warming effect. Atmospheric water vapor concentrations fluctuate dynamically based on regional temperatures and evaporation rates. Although human emissions do not directly add significant water vapor, warming caused by other greenhouse gases increases atmospheric water vapor, creating strong feedback.

**115.** (A) P-2, Q-3, R-4, S-1
Ozone layer depletion is primarily driven by synthetic chlorofluorocarbons. Acid rain forms when sulfur dioxide emissions react with atmospheric moisture. Global warming is caused predominantly by elevated carbon dioxide emissions. Eutrophication occurs when excessive phosphate and nitrate nutrients pollute water bodies. Matching these environmental issues with their corresponding chemical substances yields P-2, Q-3, R-4, S-1.

**116.** (C) Absorbs solar energy and warms the atmosphere
Black carbon is a fine particulate component of soot produced by incomplete combustion of fossil fuels, biofuels, and biomass. Unlike light-reflecting aerosols, black carbon strongly absorbs incoming solar radiation, directly warming the surrounding atmosphere. When deposited on snow and ice, it reduces surface albedo, accelerating melting and contributing significantly to regional global warming.

**117.** (A) Desertification
Overgrazing by livestock removes vegetative land cover, compacts soil, and exposes topsoil to wind and water erosion. In dryland ecosystems, persistent overgrazing strips protective plants and organic matter, deteriorating soil fertility and moisture retention capacity. This progressive degradation transforms fertile semi-arid or forested landscapes into barren, unproductive desert-like environments, illustrating the process of desertification.

**118.** (D) Photosynthesis
Photosynthesis is the principal biological process that removes carbon dioxide directly from the atmosphere. Autotrophic organisms, such as green plants, algae, and cyanobacteria, utilize light energy to convert atmospheric carbon dioxide and water into organic glucose molecules while releasing oxygen. Respiration, fossil fuel combustion, and volcanic eruptions release carbon dioxide into the atmosphere.

NODIA

**119.** (B) Total greenhouse gas emissions generated by human actions
A carbon footprint represents the total amount of greenhouse gases, primarily carbon dioxide and methane, emitted directly or indirectly into the atmosphere by human activities, individuals, organizations, events, or products. Quantified as carbon dioxide equivalent mass, measuring carbon footprints enables systematic evaluation and implementation of strategies to reduce environmental impact and climate disruption.

**120.** (C) Khejri (Prosopis cineraria)
Khejri is revered as the Kalpavriksha of the Thar Desert due to its profound ecological and socio-economic importance across arid Rajasthan. This drought-hardy tree fixes atmospheric nitrogen to enrich desert soil, stabilizes sand dunes with deep taproots, provides protein-rich fodder for livestock, yields edible pods for human consumption, and supports regional biodiversity during harsh dry periods.

**121.** (D) Groundwater pollution
Fluorosis in Rajasthan is an environmental health problem caused by consuming

**8.** The term "hotspot" in biodiversity was first coined by which of the following environmentalists?
(A) E.O. Wilson
(B) Paul Ehrlich
(C) Norman Myers
(D) Arthur Tansley

**9.** In the context of species diversity, which index is widely used to measure both species richness and species evenness in a community?
(A) Jaccard Index
(B) Sorensen Index
(C) Palmer Index
(D) Shannon-Wiener Index

**10.** Select the correct order of biological organization from the simplest level to the most complex level.
(A) Population → Ecosystem → Community → Biome
(B) Population → Community → Ecosystem → Biome
(C) Community → Population → Biome → Ecosystem
(D) Community → Population → Ecosystem → Biome

**11.** The International Union for Conservation of Nature (IUCN) maintains a comprehensive inventory of the global conservation status of biological species known as the Red List. Where is the headquarters of IUCN located?
(A) Nairobi, Kenya
(B) Gland, Switzerland
(C) Paris, France
(D) New York, USA

**12.** Consider the following statements regarding the major causes of biodiversity loss:
I. Habitat destruction and fragmentation is the primary cause of species extinction.
II. Overexploitation has led to the extinction of species like the Steller's sea cow.
III. Invasive alien species often enhance the native biodiversity of an ecosystem.
IV. Co-extinction occurs when a species becomes extinct and causes the extinction of another obligate species.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

**13.** According to the IUCN Red List criteria, a taxon is categorized as "Endangered" when:
(A) It faces a very high risk of extinction in the wild in the near future.
(B) It faces an extremely high risk of extinction in the wild in the immediate future.
(C) It is likely to become endangered unless circumstances threatening its survival improve.
(D) It has not been seen in the wild for the past 50 years.

**14.** Which of the following is considered the most significant driver of biodiversity loss globally, often referred to as the most important component of the "Evil Quartet"?
(A) Alien species invasion and spread
(B) Co-extinction of dependent species
(C) Habitat loss and fragmentation
(D) Overexploitation of biological resources

**15.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Introduction of the Nile Perch into Lake Victoria in East Africa led to the decline of indigenous cichlid fish species.
**Reason (R):** Invasive alien species often lack natural predators in their new habitats, allowing them to outcompete native species.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**16.** Identify the correct pair representing a species and its general IUCN status in India.
(A) Great Indian Bustard - Least Concern
(B) Indian Wild Ass - Extinct in the Wild
(C) Snow Leopard - Vulnerable
(D) Asiatic Cheetah - Endangered

**17.** Which of the following environmental phenomena is NOT typically classified as a direct anthropogenic cause of biodiversity loss?
(A) Agricultural expansion
(B) Milankovitch cycles
(C) Industrial pollution
(D) Poaching and illegal wildlife trade

Click Here to Buy book on Flipkart

eroded gaps and does not completely block all desertification processes toward eastern Rajasthan, making the third statement incorrect.

**131.** (A) Species restricted to a specific geographical area
Endemic species are organisms whose natural wild distribution is strictly confined or restricted to a specific geographic region, such as an island, mountain range, or distinct ecological zone, and found nowhere else globally. Because of their limited geographical range and specialized habitat dependencies, endemic species are uniquely vulnerable to habitat destruction and climate change impacts.

**132.** (C) Incineration
Incineration is a controlled thermal waste treatment process that involves combusting municipal solid waste at high temperatures. While incineration significantly reduces waste volume by up to ninety percent and recovers thermal energy for electricity generation, improper combustion operations can release harmful environmental air pollutants, including toxic heavy metal particulates, furans, and dioxins into the atmosphere.

**133.** (A) Building infrastructure to adapt to sea level rise
Climate change adaptation involves implementing proactive measures to adjust to existing or anticipated climate impacts, such as building seawalls and coastal infrastructure to protect against sea level rise and flooding. Conversely, transitioning to solar energy, enforcing carbon taxes, and phasing out hydrofluorocarbons are mitigation strategies aimed at directly reducing greenhouse gas emissions.

**134.** (D) Plastics enrich the soil with essential nutrients as they degrade.
Plastics are persistent synthetic polymers that resist natural biological degradation and do not enrich soil with nutrients. As plastics break down mechanically into fine microplastic particles, they leach toxic chemical additives into soil and water bodies, accumulate in biological food chains, entangle wildlife, and pose severe ecological hazards across terrestrial and marine habitats globally.

**135.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Indoor air pollution often poses severe human health risks due to elevated pollutant concentrations in enclosed spaces. In poorly ventilated dwellings, burning biomass fuels like wood, crop residues, and dung cakes releases high levels of fine particulate matter, carbon monoxide, and toxic organic compounds. This lack of ventilation concentrates pollutants, directly causing severe indoor respiratory illnesses.

**136.** (C) Direct emissions from owned or controlled sources
Under the Greenhouse Gas Protocol corporate standard, Scope 1 emissions represent direct greenhouse gas emissions released from sources owned or directly controlled by an organization. These include fuel combustion in company boilers, furnaces, and manufacturing machinery, as well as emissions generated by company-owned vehicle fleets and chemical processes during industrial facility operations.

**137.** (D) Rajasthan
Rajasthan was among the pioneering states in India to formulate a comprehensive State Action Plan on Climate Change directly aligned with the key priorities of the National Action Plan on Climate Change. The policy framework addresses critical regional vulnerabilities by promoting renewable energy adoption, sustainable water management, afforestation programs, and drought-resilient agricultural strategies across dryland zones.

**138.** (A) Lead, Cadmium, Beryllium
Waste electrical and electronic equipment contains hazardous heavy metals and toxic substances, including lead, cadmium, beryllium, mercury, and brominated flame retardants. When discarded e-waste is improperly handled, landfilled, or crudely recycled, these toxic heavy metal elements leach into surrounding soil and groundwater resources, posing severe environmental risks and chronic health toxicities.

**139.** (B) Nitrogen and phosphorus
Depletion of dissolved oxygen in aquatic ecosystems is primarily driven by excessive inputs of nitrogen and phosphorus nutrients from agricultural fertilizer runoff and municipal wastewater. This nutrient overload fuels rapid

Downloaded from www.pdf.tube

groundwater containing excessively high natural concentrations of dissolved fluoride. Dissolved from fluoride-rich granitic rocks and minerals in dryland aquifers, elevated fluoride levels impair human health, leading to widespread dental mottling, bone fragility, severe joint damage, and debilitating skeletal deformities across affected rural populations.

**122.** (A) Tropical Rainforest
Tropical rainforest ecosystems exhibit the highest net primary productivity among terrestrial biomes due to abundant year-round solar radiation, warm ambient temperatures, and consistent high precipitation. These optimal environmental conditions enable dense, multi-layered plant canopies to achieve exceptionally high rates of photosynthetic carbon fixation per unit area, supporting massive biomass accumulation and rich biological diversity.

**123.** (B) Global, national, and local sustainable development
Agenda 21 is a comprehensive, non-binding action plan adopted by over 178 governments at the 1992 United Nations Earth Summit in Rio de Janeiro. It serves as a global blueprint for achieving sustainable development across global, national, and local levels, addressing socio-economic development, natural resource management, environmental conservation, and multi-stakeholder participation.

**124.** (B) BOD increases sharply
When untreated municipal sewage containing high amounts of organic matter is discharged into a river, aerobic bacteria proliferate rapidly to decompose the organic pollutants. This intensive microbial decomposition process consumes large amounts of dissolved oxygen, causing the Biological Oxygen Demand of the river water to increase sharply while drastically reducing available oxygen for aquatic organisms.

**125.** (B) I and III only
Molecular nitrogen comprises nearly 78 percent of Earth atmospheric volume. Plants cannot directly absorb gaseous nitrogen from the air; instead, specialized nitrogen-fixing bacteria like Rhizobium residing in the root nodules of leguminous plants convert atmospheric nitrogen into usable chemical forms like ammonium and nitrates, enabling plant absorption and assimilation into organic proteins.

**126.** (C) Forms in air via chemical reactions of primary pollutants
A secondary pollutant is an atmospheric contaminant that is not emitted directly from a specific source, but forms within the atmosphere through complex chemical or photochemical reactions involving primary pollutants and atmospheric gases. Examples of secondary pollutants include ground-level tropospheric ozone, peroxyacetyl nitrate, sulfuric acid droplets, and photochemical smog constituents.

**127.** (C) PM 2.5
The Central Pollution Control Board identifies fine particulate matter PM 2.5 as the most dangerous airborne particle for human health. Due to its microscopic diameter of 2.5 micrometers or less, PM 2.5 bypasses nasal cilia, penetrates deep into pulmonary alveoli, and crosses into the systemic bloodstream, causing severe cardiovascular disease, lung cancer, and respiratory illnesses.

**128.** (C) Seawater absorbing excess atmospheric carbon dioxide
Ocean acidification is caused by marine waters absorbing excess anthropogenic carbon dioxide from the atmosphere. Dissolved carbon dioxide reacts chemically with ocean water to form carbonic acid, which dissociates into hydrogen and bicarbonate ions. This process lowers seawater pH and reduces carbonate ion availability, severely impairing calcifying marine organisms like corals and shellfish from constructing calcium carbonate shells.

**129.** (B) Coal
Renewable natural resources replenish naturally over short timeframes through continuous environmental cycles, including solar, wind, and tidal energy sources. In contrast, coal is a non-renewable fossil fuel formed from buried prehistoric plant vegetation subjected to heat and pressure over millions of years. Once extracted and combusted, coal reserves cannot be naturally replenished on human timescales.

**130.** (B) I, II and IV
Wind erosion significantly shifts mobile sand dunes, and over-irrigation along the Indira Gandhi Canal increases soil salinity despite greening local areas. Afforestation using species like Acacia tortilis effectively stabilizes dunes. However, the Aravalli range contains several

NODIA

# CHAPTER 11
# Biodiversity and Sustainable Development

**1.** The concept of biodiversity encompasses variations at different levels of biological organization. Which of the following levels specifically refers to the variety of genes and their alleles present within a single species?
(A) Species diversity
(B) Genetic diversity
(C) Ecological diversity
(D) Landscape diversity

**2.** Consider the following statements regarding the types of biodiversity:
I. Alpha diversity refers to the diversity within a particular area or ecosystem.
II. Beta diversity measures the change in species diversity between ecosystems.
III. Gamma diversity represents the total species diversity across a large region.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**3.** India is home to several biodiversity hotspots. Which of the following is NOT officially recognized as a distinct biodiversity hotspot partially or fully within Indian territory?
(A) Eastern Ghats
(B) The Himalayas
(C) Western Ghats
(D) Indo-Burma

**4.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Western Ghats is classified as a biodiversity hotspot.
**Reason (R):** The region is characterized by a very high level of species endemism and faces severe threat of habitat loss.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**5.** Which of the following statements regarding India's biodiversity is strictly incorrect?
(A) The Himalayan hotspot covers only the western parts of the Himalayan range.
(B) India is one of the 17 megadiverse countries in the world.
(C) The Sundaland hotspot includes the Nicobar group of islands.
(D) High species richness and high degree of endemism are primary criteria for hotspot designation.

**6.** Match List I with List II and select the correct option.
**List I: (Biodiversity Terms)**
P. Endemic species
Q. Keystone species
R. Exotic species
S. Flagship species
**List II: (Key Characteristics)**
1. Species introduced from outside their native range
2. Species chosen to represent an environmental cause
3. Species restricted to a specific geographical area
4. Species with a disproportionately large effect on its ecosystem
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-3, Q-4, R-1, S-2

**7.** Biodiversity provides significant economic benefits to humans. Which of the following represents an indirect ecological service rather than a direct economic product of biodiversity?
(A) Timber and firewood extraction
(B) Nutrient cycling and soil formation
(C) Harvesting of medicinal plants
(D) Collection of natural resins and gums

Click Here to Buy book on Amazon

growth of phytoplankton and algal blooms. Subsequent decomposition of dead biomass by aerobic bacteria consumes vast quantities of dissolved oxygen, creating hypoxic dead zones.

**140.** (B) Maximum population size an environment can indefinitely sustain

Carrying capacity represents the maximum population size of a biological species that a specific environment can sustainably support and nourish over time without undergoing ecological degradation. Dictated by environmental limiting factors such as available food, water, shelter, habitat space, and light, exceeding carrying capacity leads to resource depletion, population crashes, and ecosystem instability.

NODIA

www.nodia.in

**18.** Find the odd one out among the following plant species in the context of their impact on native Indian ecosystems.
(A) Lantana camara
(B) Parthenium hysterophorus
(C) Eichhornia crassipes
(D) Prosopis cineraria

**19.** Eutrophication in aquatic bodies heavily impacts aquatic biodiversity. This process is primarily initiated by the excessive accumulation of which of the following nutrients?
(A) Nitrogen and phosphorus
(B) Calcium and magnesium compounds
(C) Sodium and potassium compounds
(D) Iron and zinc trace elements

**20.** Arrange the following IUCN Red List categories in the correct order of decreasing risk of extinction:
I. Endangered (EN)
II. Critically Endangered (CR)
III. Vulnerable (VU)
IV. Near Threatened (NT)
(A) II, I, III, IV
(B) I, II, III, IV
(C) II, III, I, IV
(D) I, III, II, IV

**21.** Natural resources are typically classified into renewable and non-renewable categories. Which of the following clearly defines a renewable resource?
(A) A resource that replenishes naturally over a short period.
(B) A resource that is consumed faster than it can naturally regenerate, leading to depletion.
(C) A resource whose extraction and consumption cause minimal or zero atmospheric pollution.
(D) A resource that exists in a strictly finite quantity within the Earth's crust.

**22.** Match List I with List II and select the correct option.
**List I: (Type of Natural Resource)**
P. Inexhaustible Renewable
Q. Exhaustible Renewable
R. Recyclable Non-renewable
S. Non-recyclable Non-renewable
**List II: (Example)**
1. Groundwater
2. Solar energy
3. Fossil fuels
4. Iron ore
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-4, R-1, S-3
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-1, R-4, S-3

**23.** Which of the following statements regarding the Forest (Conservation) Act, 1980 is correct?
(A) It provides an absolute prohibition on the extraction and utilization of all minor forest produce by local forest communities.
(B) It requires prior central approval to divert forest land for non-forest purposes.
(C) It applies exclusively to designated reserved forests while completely excluding protected and unclassed forests from its scope.
(D) It was primarily enacted as a regulatory framework to govern and control the commercial domestic trade of wild animal species.

**24.** The Wildlife (Protection) Act, 1972 was significantly amended in 2022. Following this amendment, the number of schedules categorizing protected species was reduced. How many schedules does the amended Act currently contain?
(A) 6
(B) 5
(C) 4
(D) 3

**25.** Consider the following statements regarding the principles of natural resource conservation:
I. Conservation implies the absolute non-use of natural resources to preserve them in their pristine state.
II. Conservation aims at ensuring sustainable yield from biological resources.
III. It involves the rational utilization of resources to meet present needs without compromising future availability.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**26.** Under the amended Wildlife (Protection) Act, species listed in Schedule I are accorded the highest level of protection. Which of the following actions is strictly prohibited for Schedule I species without special authorization?
(A) Hunting and poaching

Downloaded from www.pdf.tube

**103.** (B) Fecal pollution in water sources
Coliform bacteria, such as Escherichia coli, naturally inhabit the intestinal tracts of warm-blooded animals. While most coliforms are non-pathogenic, their presence in water bodies serves as a primary biological indicator of fecal contamination. Testing positive for coliform bacteria alerts public health authorities to potential contamination by dangerous enteric pathogens and waterborne disease agents.

**104.** (C) The Environment (Protection) Act, 1986
The Environment Protection Act of 1986 is considered umbrella legislation for environmental protection in India. Enacted under Article 253 of the Constitution following the Bhopal Gas Tragedy, it provides a legal framework for central authorities to coordinate activities between state agencies, establish environmental standards, regulate industrial operations, and execute nationwide environmental protection programs.

**105.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Non-biodegradable synthetic chemical pesticides applied in agriculture enter lower levels of food chains and resist biological excretion. Through biomagnification, these chemical residues progressively accumulate at higher concentrations within consumer tissues across successive trophic levels. Consequently, top predators absorb maximum toxic concentrations, leading to reproductive failure, eggshell thinning, and severe population declines.

**106.** (A) Polluters must bear the financial cost of environmental damage
The Polluter Pays Principle is an established environmental law principle dictating that parties responsible for causing environmental pollution must bear the financial costs of managing, controlling, and remediating the resulting environmental damage. This principle internalizes environmental externalities, ensuring polluters pay for cleanup operations and compensate affected communities, thereby incentivizing industrial pollution prevention.

**107.** (B) Rio de Janeiro Conference, 1992
The 1992 United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, is globally known as the Earth Summit. This historic summit brought world leaders together to address climate change, biodiversity loss, and sustainable development, producing major international frameworks including Agenda 21, the Rio Declaration, the UNFCCC, and the Convention on Biological Diversity.

**108.** (B) Carbon captured by oceanic and coastal ecosystems
Blue carbon refers to atmospheric carbon dioxide captured, sequestered, and stored naturally by marine and coastal ecosystems, including mangroves, seagrass meadows, and salt marshes. These coastal habitats absorb carbon rapidly through photosynthesis and trap organic carbon within submerged anaerobic sediments for centuries, playing an important role in global climate change mitigation strategies.

**109.** (A) Botanical Gardens
Ex-situ conservation involves conserving threatened plant or animal species outside their natural habitats in controlled, human-managed environments like botanical gardens, zoos, gene banks, and seed facilities. Conversely, in-situ conservation preserves biological species within their natural wild habitats, as seen in national parks, wildlife sanctuaries, and biosphere reserves across diverse natural landscapes.

NODIA

**110.** (C) Pali and Balotra
The concentrated textile dyeing and printing industrial clusters in Pali and Balotra districts in Rajasthan have historically discharged massive volumes of untreated, highly toxic chemical effluents into local river basins. This heavy industrial discharge has caused severe surface water and groundwater pollution along the Luni and Bandi river systems, degrading agricultural lands.

**111.** (D) Carbon Dioxide
Carbon dioxide is a major long-lived atmospheric greenhouse gas that drives global warming. While transparent to incoming shortwave solar radiation, carbon dioxide molecules absorb outgoing longwave thermal infrared radiation emitted by Earth surface. Re-emitting this absorbed thermal heat back toward the lower atmosphere traps energy, creating the greenhouse effect and driving global surface temperature increases.

which global convention is it listed as a site of international importance?
(A) Ramsar Convention
(B) Stockholm Convention
(C) Basel Convention
(D) Rotterdam Convention

**36.** Which of the following statements correctly describes a key feature of Ranthambore National Park?
(A) It is primarily famous for the conservation of the Great Indian Bustard.
(B) It was the last sanctuary in Rajasthan to be included under Project Tiger.
(C) It is located at the junction of the Aravalli and Vindhya hill ranges.
(D) It is characterized predominantly by alpine vegetation.

**37.** Which of the following statements regarding the Desert National Park is strictly incorrect?
(A) It is dominated by dense evergreen forests and high annual rainfall.
(B) It represents one of the largest protected desert ecosystems and protected areas in India.
(C) It provides a crucial breeding and foraging habitat for the endangered Great Indian Bustard.
(D) It features varied desert landscapes including sand dunes, craggy rocks, and salt lake bottoms.

**38.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Sariska Tiger Reserve faced a temporary local extinction of tigers in the mid-2000s.
**Reason (R):** Rampant poaching and severe habitat degradation led to the disappearance of the entire tiger population from Sariska.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**39.** Apart from Ranthambore, Sariska, and Mukundra Hills, which protected area was designated as the fourth Tiger Reserve of Rajasthan?
(A) Tal Chhapar Sanctuary
(B) Ramgarh Vishdhari Wildlife Sanctuary
(C) Sita Mata Wildlife Sanctuary
(D) Kumbhalgarh Wildlife Sanctuary

**40.** Select the correct chronological order of the establishment/declaration of the following Tiger Reserves in Rajasthan (from earliest to latest).
(A) Ranthambore → Sariska → Mukundra Hills → Ramgarh Vishdhari
(B) Sariska → Ranthambore → Mukundra Hills → Ramgarh Vishdhari
(C) Ranthambore → Mukundra Hills → Sariska → Ramgarh Vishdhari
(D) Sariska → Mukundra Hills → Ranthambore → Ramgarh Vishdhari

**41.** In the context of biodiversity conservation, the term "in-situ conservation" specifically refers to:
(A) Conserving threatened species in artificial environments outside their natural habitats.
(B) Storing reproductive genetic material for long periods in cryogenic gene banks.
(C) Cultivating rare and threatened plant species in controlled ex-situ botanical gardens.
(D) Conserving species within their natural ecosystems.

**42.** Match List I with List II and select the correct option.
**List I: (Conservation Strategy)**
P. In-situ Conservation
Q. Ex-situ Conservation
R. Ex-situ Plant Conservation
S. Ex-situ Animal Conservation
**List II: (Example)**
1. Botanical Garden
2. Biosphere Reserve
3. Cryopreservation of sperm/eggs
4. Zoological Park
(A) P-2, Q-3, R-1, S-4
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**43.** "Project Tiger" was launched by the Government of India to ensure a viable population of tigers in their natural habitats. In which year was this project initiated?
(A) 1970
(B) 1972
(C) 1973
(D) 1980

Click Here to Buy book on Flipkart

(D) P-3, Q-1, R-4, S-2

**61.** Sustainable Development Goal (SDG) 15 aims to "Protect, restore and promote sustainable use of terrestrial ecosystems". Which of the following is an explicit target of SDG 15?
(A) Achieving land degradation neutrality
(B) Ending overfishing in the high seas
(C) Ensuring universal access to affordable electricity
(D) Eliminating marine plastic pollution

**62.** Consider the following statements regarding Joint Forest Management (JFM) in India:
I. JFM involves a partnership between local communities and the state forest department.
II. Local communities are entitled to a share in the usufructs (minor forest produce) and a portion of the timber revenue in return for protecting the forest.
III. It transfers the absolute ownership of the forest land from the government to the village panchayat.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**63.** The concept of Joint Forest Management (JFM) achieved significant early success and recognition in India from an initiative started in the 1970s to recover degraded sal forests. In which state did this pioneering Arabari experiment take place?
(A) Madhya Pradesh
(B) Rajasthan
(C) Uttarakhand
(D) West Bengal

**64.** Which of the following statements about the interrelationship between biodiversity and climate change is incorrect?
(A) Climate change alters species distribution, pushing many species towards higher latitudes and altitudes.
(B) Healthy and diverse ecosystems exhibit higher resilience to climate extremes compared to degraded ones.
(C) Global warming is expected to uniformly increase the species richness of all terrestrial ecosystems.
(D) Deforestation and loss of biodiversity lead to a reduction in carbon sequestration, thereby accelerating climate change.

**65.** Identify the correctly matched pair of Sustainable Development Goal (SDG) and its primary objective.
(A) SDG 4 - Gender Equality
(B) SDG 2 - Zero Hunger
(C) SDG 7 - Decent Work and Economic Growth
(D) SDG 11 - Climate Action

**66.** Which of the following is NOT a direct target or focus area of Sustainable Development Goal 13 (Climate Action)?
(A) Strengthening climate resilience and adaptive capacity to severe climate-related hazards and natural disasters across all nations.
(B) Integrating comprehensive climate change measures and mitigation strategies directly into national planning and policies.
(C) Improving education, human capacity, and institutional awareness regarding climate change mitigation and impact reduction.
(D) Substantially reducing youth unemployment, lack of education, or training.

**67.** How does increased atmospheric $CO_2$ directly threaten marine biodiversity, specifically coral reefs?
(A) By causing ocean acidification, reducing carbonate ions for shell formation.
(B) By drastically decreasing the natural salinity levels of deep and surface ocean water bodies globally.
(C) By significantly increasing the overall concentration of dissolved atmospheric oxygen in the ocean surface layer.
(D) By rapidly promoting the excessive growth of cold-water kelp forests that physically outcompete tropical corals.

**68.** Consider the following roles local communities can play in forest management:
I. Acting as guards against illegal timber smuggling and poaching.
II. Utilizing traditional knowledge for controlled rotational grazing.
III. Reporting forest fires early to authorities.
IV. Unrestricted commercial logging for village revenue generation.
Which of the above statement(s) reflects sustainable community participation?
(A) I, II, and III only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

NODIA

**53.** Under the Biological Diversity Act, 2002, who is responsible for preparing the People's Biodiversity Register (PBR) at the local level?
(A) Biodiversity Management Committee
(B) National Biodiversity Authority
(C) State Biodiversity Board
(D) Ministry of Environment, Forest and Climate Change

**54.** The term "Sustainable Development" gained international prominence after it was defined in a 1987 report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Which report introduced this definition?
(A) The Club of Rome Report
(B) The Agenda 21 Report
(C) The Intergovernmental Panel on Climate Change (IPCC) Report
(D) The Brundtland Report (Our Common Future)

**55.** Which of the following statements regarding Sustainable Development is incorrect?
(A) It advocates for the integration of economic growth, social equity, and environmental protection.
(B) It encourages the depletion of natural capital as long as man-made capital is generated.
(C) It promotes the utilization of renewable energy sources over fossil fuels.
(D) It emphasizes intra-generational and inter-generational equity.

**56.** Arrange the following major international milestones related to sustainable development and environment in chronological order (earliest to latest):
I. Earth Summit (Rio de Janeiro)
II. Stockholm Conference on the Human Environment
III. Adoption of the Sustainable Development Goals (SDGs)
IV. World Summit on Sustainable Development (Johannesburg)
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) I, III, II, IV

**57.** In the context of the Biological Diversity Act, what does the principle of "Access and Benefit Sharing" (ABS) ensure?
(A) That commercial industrial enterprises can access protected public forests freely and without regulatory restrictions.
(B) That genetic resources are shared equally among all nations globally without any monetary or non-monetary exchange requirements.
(C) That all national wildlife sanctuaries and parks are kept fully open to the public for free unrestricted access.
(D) That local knowledge holders receive fair benefits from resource commercialization.

**58.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Sustainable development inherently requires the eradication of absolute poverty.
**Reason (R):** Poverty often forces people to over-exploit environmental resources for their immediate survival, leading to ecological degradation.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**59.** Which of the following represents the core "three pillars" of sustainable development?
(A) Industrialization, Urbanization, and Globalization
(B) Economy, Society, and Environment
(C) Education, Health, and Infrastructure
(D) Policy, Implementation, and Monitoring

**60.** Match List I with List II and select the correct option.
**List I: (Sustainable Development Goal)**
P. SDG 6
Q. SDG 13
R. SDG 14
S. SDG 15
**List II: (Theme)**
1. Climate Action
2. Life on Land
3. Life Below Water
4. Clean Water and Sanitation
(A) P-1, Q-4, R-2, S-3
(B) P-4, Q-1, R-3, S-2
(C) P-4, Q-3, R-1, S-2

NODIA

sediments and toxins

**78.** Consider the following characteristics that make an area eligible to be declared a Ramsar wetland:
I. It contains a representative, rare, or unique example of a natural wetland type.
II. It regularly supports 20,000 or more waterbirds.
III. It supports vulnerable, endangered, or critically endangered species.
IV. It is an important source of food for fishes, spawning ground, nursery, or migration path.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

**79.** Sambhar Lake in Rajasthan is a designated Ramsar site. Which unique ecological feature characterizes this wetland?
(A) It is a high-altitude natural freshwater lake situated in the central region of the Aravalli range.
(B) It is a dense coastal mangrove wetland ecosystem that protects coastal communities against storm surges.
(C) It is a massive artificial reservoir constructed primarily to generate hydroelectric power and provide canal irrigation.
(D) It is India's largest inland saline lake and key flamingo habitat.

**80.** Arrange the following typical ecological zones of a wetland ecosystem based on water depth, starting from the deepest open water to the dry upland:
I. Submergent zone (plants entirely underwater)
II. Emergent zone (plants rooted in water but growing above the surface)
III. Open water zone (too deep for rooted plants)
IV. Riparian/Upland transition zone
(A) III, I, II, IV
(B) I, II, III, IV
(C) III, II, I, IV
(D) IV, II, I, III

**81.** In Rajasthan, the Bishnoi community is historically renowned for their deeply ingrained cultural commitment to environmental conservation. They famously sacrificed their lives in 1730 to protect which species of tree?
(A) Peepal (Ficus religiosa)
(B) Khejri (Prosopis cineraria)
(C) Banyan (Ficus benghalensis)
(D) Rohida (Tecomella undulata)

**82.** Consider the following statements regarding gene banks and seed banks:
I. They are ex-situ conservation facilities that store genetic material.
II. Seed banks maintain the viability of seeds by storing them in highly humid and warm conditions.
III. They are crucial for preserving the genetic diversity of traditional crop varieties against agricultural homogenization.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**83.** Cryopreservation is an advanced ex-situ conservation technique used in gene banks to preserve biological material for long periods. What is the standard temperature at which biological samples are maintained in liquid nitrogen for this purpose?
(A) -80°C
(B) -130°C
(C) -196°C
(D) -273°C

**84.** "Traditional Ecological Knowledge" (TEK) plays a vital role in biodiversity conservation. What does TEK primarily refer to?
(A) Scientific knowledge acquired exclusively through contemporary peer-reviewed laboratory experiments and controlled field studies.
(B) Quantitative ecological information systematically stored in centralized digital global biodiversity databases and repositories.
(C) Cumulative knowledge and beliefs developed by indigenous peoples over generations.
(D) Formal international environmental treaties and legal accords drafted by modern conservation scientists and diplomats.

**85.** Which of the following statements regarding the Svalbard Global Seed Vault is incorrect?
(A) It is designed to be highly vulnerable to climate change and rising sea levels.
(B) It is located in the remote Arctic archipelago

Downloaded from www.pdf.tube

**69.** Climate change often causes shifts in the timing of biological events, such as the early blooming of flowers or altered migration times. What is the scientific term for these lifecycle events?
(A) Phenology
(B) Morphology
(C) Phylogeny
(D) Etymology

**70.** Select the correct general sequence of steps involved in establishing a Joint Forest Management (JFM) program at the village level.
(A) Formation of Forest Protection Committee → Signing MoU with Forest Dept → Preparation of Micro-plan → Implementation & Benefit Sharing
(B) Preparation of Micro-plan → Formation of Forest Protection Committee → Implementation & Benefit Sharing → Signing MoU with Forest Dept
(C) Signing MoU with Forest Dept → Implementation & Benefit Sharing → Formation of Forest Protection Committee → Preparation of Micro-plan
(D) Formation of Forest Protection Committee → Implementation & Benefit Sharing → Preparation of Micro-plan → Signing MoU with Forest Dept

**71.** In conservation biology, a "wildlife corridor" is best defined as:
(A) A legally protected large core zone situated within a designated biosphere reserve or national park.
(B) A habitat strip connecting wildlife populations separated by human activities.
(C) A specialized indoor zoo exhibit structurally designed to mimic a natural riverine or wetland ecosystem.
(D) A continuous physical barrier constructed along boundaries to prevent wild animals from entering agricultural fields.

**72.** Consider the following statements regarding the ecological importance of wildlife corridors:
I. They facilitate the seasonal migration of large mammals like elephants.
II. They promote gene flow between isolated populations, reducing the risk of inbreeding.
III. They completely eliminate the "edge effect" in the connected forest patches.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**73.** The Ramsar Convention is an international treaty for the conservation and sustainable use of wetlands. In which year was the convention signed in the Iranian city of Ramsar?
(A) 1971
(B) 1981
(C) 1992
(D) 2002

**74.** Which of the following statements about the "Montreux Record" is incorrect?
(A) Adding an Indian site to it requires a constitutional amendment by Parliament.
(B) It is an official international register of wetland sites designated under the List of Wetlands of International Importance.
(C) Sites are added to it where adverse changes in ecological character have occurred, are occurring, or are likely to occur due to human action.
(D) Keoladeo National Park in Rajasthan is an example of a wetland site that is currently listed in the Montreux Record.

NODIA

**75.** Currently, which of the following lakes/wetlands in Rajasthan are designated as Ramsar sites?
(A) Pichola Lake and Fateh Sagar Lake
(B) Sambhar Salt Lake and Keoladeo National Park
(C) Ana Sagar Lake and Pushkar Lake
(D) Nakki Lake and Siliserh Lake

**76.** Wildlife corridors often consist of narrow strips of habitat. Because they are narrow, species moving through them are highly exposed to the environmental conditions and predators of the surrounding altered landscape. This phenomenon is ecologically known as:
(A) The Allee effect
(B) The Edge effect
(C) The Bottleneck effect
(D) The Founder effect

**77.** Wetlands are often called "the kidneys of the landscape." Which of the following is NOT typically a functional ecological benefit of wetlands?
(A) High-yield extraction of fossil fuels
(B) Flood control and storm buffering
(C) Groundwater recharge
(D) Water purification through the trapping of

Convention on Biological Diversity.
(C) It provides a transparent legal framework for the effective implementation of Access and Benefit-sharing (ABS).
(D) It acknowledges the rights of indigenous communities over their traditional knowledge associated with genetic resources.

**94.** The biodiversity of the Thar Desert in Rajasthan is uniquely adapted to extreme arid conditions. In this context, "desertification" refers to:
(A) The natural geological expansion of desert boundaries driven primarily by long-term movement of tectonic plates.
(B) The widespread ecological process of greening hyper-arid desert biomes using extensive artificial canal irrigation systems.
(C) Land degradation in drylands resulting from climatic variations and human activities.
(D) The atmospheric phenomenon of sustained increased annual rainfall permanently converting arid deserts into tropical savannas.

**95.** Which of the following desert bird species is the State Bird of Rajasthan and is currently categorized as 'Critically Endangered' on the IUCN Red List?
(A) Houbara Bustard (Asian Houbara)
(B) Indian Peafowl (Common Peafowl)
(C) Demoiselle Crane (Kurja crane)
(D) Great Indian Bustard (Godawan)

**96.** The Khejri tree (Prosopis cineraria) is considered the lifeline of the Thar Desert. What makes it ecologically indispensable for desert biodiversity and sustainable agriculture?
(A) Its extensive shallow root system allows it to completely monopolize surface soil water, suppressing adjacent vegetation growth.
(B) It requires consistently heavy annual rainfall, successfully creating dense localized micro-rainforests within desert biomes.
(C) It fixes atmospheric nitrogen to enrich soil and provides drought fodder.
(D) Its wood and foliage produce highly toxic chemical compounds that repel all native desert fauna, ensuring its solitary survival.

**97.** Match List I with List II and select the correct option.
**List I: (Fauna)**
P. Chinkara (Indian Gazelle)
Q. Desert Fox
R. Spiny-tailed Lizard
S. Godawan (GIB)
**List II: (Classification/Feature)**
1. State Bird
2. State Animal (Wildlife Category)
3. Carnivore adapted to arid zones
4. Herbivorous reptile of the desert
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-2, Q-4, R-3, S-1
(D) P-3, Q-1, R-4, S-2

**98.** Plants growing in the desert ecosystem of Rajasthan, such as Euphorbia and Opuntia, exhibit specific morphological adaptations to minimize water loss. Such plants are ecologically termed as:
(A) Hydrophytes
(B) Halophytes
(C) Epiphytes
(D) Xerophytes

**99.** Which of the following correctly describes the "Aichi Biodiversity Targets"?
(A) 20 global targets to halt biodiversity loss adopted under CBD for 2011–2020.
(B) A legally binding international environmental treaty designed to phase out and eliminate persistent organic pollutants globally.
(C) Mandatory international trade guidelines strictly regulating endangered wildlife species, officially formulated under CITES provisions.
(D) The official legally binding greenhouse gas carbon emission reduction targets negotiated by sovereign states during the Paris Agreement.

**100.** Which of the following is NOT typically a part of the natural desert flora of Rajasthan?
(A) Rohida (Tecomella undulata)
(B) Kair (Capparis decidua)
(C) Sundari (Heritiera fomes)
(D) Phog (Calligonum polygonoides)

**101.** "Sustainable Agriculture" focuses on producing food and fiber in a way that respects natural ecological cycles. Which of the following practices is fundamentally opposed to the principles of sustainable agriculture?
(A) Monocropping reliant on synthetic chemical fertilizers.
(B) Integrated Pest Management using combined ecological controls.

Click Here to Buy book on Amazon

of Svalbard, Norway.
(C) It serves as a backup facility for the world's crop diversity.
(D) It provides long-term storage of duplicates of seeds conserved in gene banks globally.

**86.** Identify the correctly matched pair of traditional community conservation practice and its associated Indian state.
(A) Devarakadus - Himachal Pradesh
(B) Sacred Groves of Khasi Hills - Kerala
(C) Kavus - Meghalaya
(D) Orans - Rajasthan

**87.** "Sacred groves" are patches of forest dedicated to local deities and protected by local communities. From an ecological perspective, what is the most significant conservation benefit of these groves?
(A) They provide vast forest areas specifically designated and managed for intensive commercial timber logging.
(B) They act as refugia for rare species lost in surrounding degraded landscapes.
(C) They serve as major industrial extraction sites for mining precious metals and mineral resources.
(D) They are purposefully cleared to allow for the widespread introduction of fast-growing exotic commercial plantation species.

**88.** Consider the following statements on how the Biological Diversity Act, 2002 addresses traditional knowledge:
I. It requires the prior approval of the NBA for applying for intellectual property rights based on research using Indian biological resources.
II. It mandates that benefit sharing be directed only to the central government, bypassing local knowledge holders.
III. It protects the traditional knowledge of local communities through the documentation in People's Biodiversity Registers (PBRs).
IV. It exempts local traditional healers (Vaidyas and Hakims) from seeking permission to use biological resources.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, and IV only

**89.** Find the odd one out in the context of sacred groves in India.
(A) Orans of Rajasthan
(B) Kavus of Kerala
(C) Devrais of Maharashtra
(D) Biosphere Reserves

**90.** Which of the following is NOT an advantage of maintaining agricultural seed banks?
(A) Guaranteeing immediate high crop yields for current farmers.
(B) Preserving traditional crop landraces that naturally possess genetic resistance to local pests and environmental diseases.
(C) Acting as a vital global insurance policy against catastrophic ecological agricultural crop failures.
(D) Providing essential diverse genetic material required for future scientific plant and crop breeding programs.

**91.** The Convention on Biological Diversity (CBD) is a key international treaty. At which major international event was the CBD opened for signature?
(A) The Stockholm Conference on the Human Environment, 1972
(B) The United Nations Conference on Environment and Development (Earth Summit), 1992
(C) The Kyoto Protocol Conference, 1997
(D) The Paris Climate Change Conference, 2015

**92.** The Cartagena Protocol, a supplementary agreement to the Convention on Biological Diversity (CBD), primarily addresses which of the following issues?
(A) Regulating global access to genetic resources and ensuring fair and equitable benefit sharing among nations.
(B) Safe handling and use of Living Modified Organisms (LMOs) from modern biotechnology.
(C) Conservation and wise environmental protection of wetlands designated as sites of international importance.
(D) Progressively phasing out the industrial production and international trade of atmospheric ozone-depleting substances.

**93.** Which of the following statements concerning the Nagoya Protocol is incorrect?
(A) It explicitly mandates the complete cessation of all commercial research on biological resources.
(B) It is a supplementary agreement to the

NODIA

**44.** Consider the following statements regarding 'Project Elephant':
I. It was launched in 1992 as a Centrally Sponsored Scheme.
II. Its primary objective is to protect elephants, their habitats, and corridors.
III. It aims to address issues of human-elephant conflict.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**45.** Identify the incorrectly matched pair relating to conservation types.
(A) Wildlife Sanctuaries - Ex-situ conservation
(B) Sacred Groves - In-situ conservation
(C) National Parks - In-situ conservation
(D) Tissue Culture Labs - Ex-situ conservation

**46.** Which of the following is NOT an example of ex-situ conservation?
(A) Off-site crop seed banks
(B) Botanical arboretums
(C) Biosphere reserves
(D) Artificial aquariums

**47.** What is the primary ecological purpose of a modern zoological park in the context of wildlife conservation?
(A) To provide a public venue exclusively aimed at commercial entertainment and recreation.
(B) To harvest and trade animal products commercially under direct government supervision.
(C) To completely replace and substitute natural wild habitats for displaced animal species.
(D) To run captive breeding programs for endangered species.

**48.** "MIKE" is an international program intrinsically linked to the conservation of which of the following animals?
(A) Tigers
(B) Snow Leopards
(C) Elephants
(D) Rhinoceroses

**49.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Ex-situ conservation is often the only viable option for species with highly fragmented or completely degraded natural habitats.
**Reason (R):** It allows for direct human intervention in the breeding and care of the species, removing them from immediate environmental threats.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**50.** Find the odd one out concerning the method of biodiversity conservation.
(A) Nilgiri Biosphere Reserve
(B) Agasthyamalai Hills
(C) Nanda Devi National Park
(D) Pusa National Gene Bank

**51.** The Biological Diversity Act was enacted in India in 2002 to meet the obligations under the Convention on Biological Diversity (CBD). Where is the headquarters of the National Biodiversity Authority (NBA) established under this Act?
(A) Chennai
(B) New Delhi
(C) Dehradun
(D) Bengaluru

**52.** Consider the following statements regarding the Biological Diversity Act, 2002:
I. It provides a legal framework for fair and equitable sharing of benefits arising out of the use of biological resources.
II. It established a three-tier structure comprising the NBA, State Biodiversity Boards (SBBs), and Biodiversity Management Committees (BMCs).
III. Any foreign individual or entity must obtain approval from the NBA before accessing biological resources in India for research.
IV. Indian citizens are strictly prohibited from utilizing any biological resource even for traditional medical practices.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

Downloaded from www.pdf.tube

(C) Diversified agricultural crop rotation and polyculture systems.
(D) Soil conservation tillage combined with organic mulching practices.

**102.** In the context of sustainable water management in agriculture, what is the primary advantage of the drip irrigation method over traditional flood irrigation?
(A) It requires significantly lower financial capital investment and routine operational maintenance compared to traditional flood irrigation.
(B) It causes the regional underground water table to rise rapidly, completely eliminating the long-term need for deep groundwater pumping.
(C) It continuously washes away excess topsoil nutrients, effectively preventing any toxic chemical element buildup within the soil profile.
(D) It applies water directly to roots, reducing evaporation and percolation losses.

**103.** Which of the following statements about organic farming, a core component of sustainable agriculture, is correct?
(A) It heavily utilizes high-yielding genetically modified organisms (GMOs) to maximize seasonal crop outputs.
(B) It relies on crop rotation, compost, and biological pest control for soil health.
(C) It completely prohibits the application of any organic or inorganic fertilizer, relying solely on natural rainwater.
(D) It uses synthetic chemical pesticides exclusively on a strict schedule to guarantee zero economic crop loss.

**104.** Rajasthan has a rich heritage of traditional water harvesting structures designed for sustainable water management. Which of the following is NOT a traditional water harvesting structure of Rajasthan?
(A) Tanka
(B) Johad
(C) Surangam
(D) Baori (Stepwell)

**105.** The 'Khadin' system of water harvesting and agriculture is uniquely suited to desert environments. In which district of Rajasthan is this system most traditionally and widely practiced?
(A) Udaipur
(B) Banswara
(C) Kota
(D) Jaisalmer

**106.** Match List I with List II and select the correct option.
**List I: (Traditional Water Structure)**
P. Tanka
Q. Johad
R. Khadin
S. Baori
**List II: (Typical Feature)**
1. Earthen check dam to capture and conserve rainwater
2. Underground cylindrical cistern for storing rainwater
3. Stepwell featuring intricate architectural steps to reach groundwater
4. Agricultural runoff harvesting system in arid tracts
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-1, S-3

**107.** Integrated Pest Management (IPM) is a sustainable agricultural approach. How does IPM propose to handle pest populations?
(A) By completely eradicating all insect and microbial species in the field through regular applications of broad-spectrum chemical sprays.
(B) By combining biological, cultural, and chemical tools to minimize ecological and health risks.
(C) By ignoring agricultural pest populations entirely and letting natural selection operate freely regardless of severe economic crop loss.
(D) By relying exclusively on intensive chemical pesticide applications as a routine preventive measure long before any pests appear.

NODIA

**108.** Find the odd one out among the following regarding agricultural irrigation methods.
(A) Overhead sprinkler irrigation system
(B) Surface flood irrigation
(C) Sub-surface drip irrigation system
(D) Micro-sprayer irrigation system

**109.** What is the primary ecological purpose of incorporating crop rotation in a sustainable farming system?

(A) To improve soil structure, break pest cycles, and replenish nutrients like nitrogen.
(B) To simplify mechanized harvesting operations by ensuring that all planted crops ripen simultaneously on the exact same day.
(C) To maximize the absorption efficiency of synthetic chemical fertilizers by systematically changing the commercial crop type each season.
(D) To intentionally ensure that the vulnerable topsoil surface remains completely bare and unplanted for at least six months every year.

**110.** Which of the following statements regarding rainwater harvesting is incorrect?
(A) It helps in recharging local groundwater aquifers.
(B) It reduces the rapid surface runoff that causes soil erosion during heavy monsoons.
(C) It is only effective in regions that receive continuous rainfall throughout the year.
(D) It can provide a decentralized and reliable source of water for domestic and agricultural use.

**111.** Rajasthan has two state animals, classified into the 'Wildlife' and 'Livestock' categories. The Chinkara is the state animal in the wildlife category. Which animal holds this status in the livestock category?
(A) Desert Fox
(B) Blackbuck
(C) Marwari Horse
(D) Camel

**112.** The Tal Chhapar Sanctuary in the Churu district of Rajasthan is famous for its unique ecosystem consisting of open grasslands. Which specific animal is this sanctuary primarily known for conserving?
(A) Bengal Tiger
(B) Sloth Bear
(C) Blackbuck
(D) Indian Rhinoceros

**113.** Which of the following statements concerning the Sita Mata Wildlife Sanctuary in Rajasthan is correct?
(A) It is the primary habitat of the Asiatic Lion in Rajasthan.
(B) It is renowned for the presence of the elusive flying squirrel.
(C) It consists entirely of barren sand dunes with zero forest cover.
(D) It is located in the extreme northern tip of the state in Sri Ganganagar.

**114.** While Rajasthan has numerous Wildlife Sanctuaries, certain districts have specialized conservation reserves rather than large sanctuaries. Which of the following areas is designated as a leopard conservation reserve rather than a full-fledged National Park?
(A) Ranthambore core area
(B) Keoladeo core area
(C) Mukundra Hills core area
(D) Jawai Bandh area

**115.** Identify the correctly matched pair of a Wildlife Sanctuary in Rajasthan and the major river associated with or flowing near/through it.
(A) National Chambal Sanctuary - Chambal River
(B) Ramgarh Vishdhari Sanctuary - Luni River
(C) Desert National Park - Banas River
(D) Sita Mata Sanctuary - Ghaggar River

**116.** In recent years, Rajasthan has declared several 'Conservation Reserves' to protect wildlife outside traditional protected areas. What is a defining characteristic of a Conservation Reserve under the Wildlife (Protection) Act?
(A) It is declared exclusively on private agricultural land by landowners without any state forest department involvement.
(B) It legally permits and facilitates unregulated large-scale commercial open-cast mining activities within its boundaries.
(C) It acts as a buffer between protected areas, involving community consultation.
(D) It strictly prohibits the physical entry of all human beings under any circumstances, including authorized research staff.

**117.** The Dholpur-Karauli area was designated regarding wildlife conservation in Rajasthan as which of the following?
(A) It has been declared the state's fifth Tiger Reserve.
(B) It is the site of the new state botanical garden.
(C) It has been completely de-notified from the protected area network.
(D) It is the first dedicated marine sanctuary of Rajasthan.

**118.** The term 'Oran' in the socio-cultural context of Rajasthan refers to:

Click Here to Buy book on Flipkart

(A) A traditional handloom weaving technique used exclusively for producing patterned cotton textiles.
(B) A seasonal nomadic pastoral practice involving large-scale cattle migration across desert districts.
(C) A folk cultural festival celebrated annually across rural communities to mark the onset of the monsoon.
(D) A sacred grove dedicated to a local deity where tree cutting is forbidden.

**119.** Which of the following statements about Machia Biological Park is incorrect?
(A) It is located near Jodhpur.
(B) It is a natural biosphere reserve characterized by dense alpine forests.
(C) It functions as an ex-situ conservation facility featuring a zoological garden.
(D) It is centered around the Kaylana Lake.

**120.** Which of the following represents the most severe and immediate anthropogenic threat leading to the high mortality of the Great Indian Bustard (GIB) in the Thar landscape?
(A) Severe over-predation on eggs and chicks by wild populations of local desert foxes.
(B) Highly infectious avian diseases transmitted directly by seasonal migratory waterbirds.
(C) Collisions with high-tension power transmission lines.
(D) Prolonged periods of extreme cold waves and low temperatures during the winter season.

**121.** In ecological terms, what defines a "keystone species"?
(A) A highly abundant species that provides the vast majority of living biological biomass in a specific ecosystem.
(B) An invasive exotic species that rapidly adapts to heavily degraded human urban and suburban environments.
(C) A prehistoric species that is extinct but whose fossil remains are used extensively for geological strata dating.
(D) A species with a disproportionately large effect on ecosystem structure and function.

**122.** "Endemism" is a critical concept in prioritizing areas for conservation. It refers to:
(A) A state where a species is naturally restricted to one specific geographic location.
(B) A widespread infectious disease outbreak occurring periodically among wild animal populations.
(C) The regular seasonal migration of migratory bird species across different continents and flyways.
(D) The long-term evolutionary process of species becoming extinct primarily through natural selection.

**123.** Which of the following statements accurately describes an "ecotone"?
(A) It is the exact geographic center of a stable climax ecological community where biodiversity is at its lowest level.
(B) A transition zone between two biological communities displaying high species richness.
(C) It is a heavily contaminated industrial or urban zone that is completely devoid of all forms of biological life.
(D) It is the benthic deep-ocean aphotic zone where absolute darkness prevails and no sunlight ever penetrates.

**124.** Biodiversity provides various ecosystem services. Which of the following is NOT an example of a "cultural ecosystem service"?
(A) Ecotourism and outdoor nature recreation
(B) Biological nitrogen fixation by bacteria
(C) Cultural spiritual and religious enrichment
(D) Aesthetic appreciation of natural scenery

**125.** The Indian Elephant is granted high conservation priority. What specific official designation has the Government of India accorded to the elephant?
(A) National Heritage Animal
(B) Official National Aquatic Animal
(C) Designated National Reptile
(D) Official National Beast of Burden

**126.** Match List I with List II and select the correct option.
**List I: (Biodiversity Concept/Term)**
P. Biodiversity (term popularized by)
Q. Biodiversity Hotspot
R. Alpha, Beta, Gamma diversity
S. Biological nomenclature (Binomial)
**List II: (Scientist)**
1. Norman Myers
2. Edward O. Wilson
3. Carl Linnaeus
4. Robert Whittaker
(A) P-1, Q-2, R-3, S-4
(B) P-4, Q-1, R-2, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-2, Q-3, R-1, S-4

Downloaded from www.pdf.tube

compromising future generations' ability to meet their own requirements.

**55.** (B) It encourages the depletion of natural capital as long as man-made capital is generated.
Sustainable development rejects the unchecked depletion of natural capital, emphasizing that manufactured capital cannot replace critical natural ecosystem services. Instead, it advocates integrating economic growth, environmental protection, and social equity. Sustainable development stresses intra-generational and inter-generational equity while actively encouraging the widespread transition toward clean, renewable energy sources over fossil fuels.

**56.** (A) II, I, IV, III
Major international sustainability milestones occurred across pivotal historical conferences. The United Nations Conference on the Human Environment took place in Stockholm in 1972. The Earth Summit in Rio de Janeiro followed in 1992. The World Summit on Sustainable Development convened in Johannesburg in 2002, culminating in the adoption of Sustainable Development Goals in 2015.

**57.** (D) That local knowledge holders receive fair benefits from resource commercialization.
The Access and Benefit Sharing framework under the Biological Diversity Act ensures that when commercial entities utilize biological resources or associated traditional knowledge, fair and equitable monetary or non-monetary benefits flow back to local indigenous communities. This system protects traditional knowledge holders and incentivizes local environmental stewardship, preventing bio-piracy.

**58.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Eradicating absolute poverty is an essential prerequisite for achieving global sustainable development. Individuals living in extreme poverty are frequently forced to over-exploit local natural resources, such as forests and soils, for immediate survival needs. Addressing poverty relieves immediate environmental pressure, enabling communities to adopt long-term sustainable land management and resource practices.

**59.** (B) Economy, Society, and Environment
Sustainable development is fundamentally built upon three interdependent core pillars: economic sustainability, social equity, and environmental protection. Often referred to as the triple bottom line, true long-term sustainability requires balancing economic growth, social well-being, and ecological preservation without allowing progress in one domain to destroy or degrade another pillar.

**60.** (B) P-4, Q-1, R-3, S-2
The Sustainable Development Goals outline specific international targets. SDG Six focuses on ensuring Clean Water and Sanitation for all. SDG Thirteen addresses urgent Climate Action to combat environmental impacts. SDG Fourteen covers Life Below Water, emphasizing marine conservation, while SDG Fifteen dedicated to Life on Land promotes terrestrial ecosystem protection.

**61.** (A) Achieving land degradation neutrality
Sustainable Development Goal Fifteen explicitly focuses on protecting, restoring, and promoting sustainable management of terrestrial ecosystems, halting deforestation, and reversing land degradation. A primary quantitative target under SDG Fifteen is achieving land degradation neutrality worldwide, ensuring that the total quantity and quality of land resources necessary to support ecosystem functions remains stable.

**62.** (A) I and II only
Joint Forest Management represents a collaborative partnership established between local village communities and state forest departments to restore and protect degraded state forests. Participating local communities receive usufruct rights to minor forest produce and a designated share of timber revenues. However, legal land ownership remains firmly with the government rather than village panchayats.

**63.** (D) West Bengal
The pioneering Arabari experiment, initiated in 1971 in the Paschim Medinipur district of West Bengal, serves as the historic precursor to Joint Forest Management in India. Forest officer A.K. Banerjee engaged local villagers to protect severely degraded sal forests, demonstrating that community involvement paired with economic incentives leads to successful forest recovery.

NODIA

(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-2, S-1
(D) P-4, Q-3, R-1, S-2

**136.** Agroforestry is promoted as a sustainable agriculture practice. What is the defining characteristic of an agroforestry system?
(A) The exclusive large-scale cultivation of annual agricultural cash crops without maintaining any surrounding tree cover.
(B) The complete clear-cutting and conversion of native natural forests into industrial monoculture agricultural land holdings.
(C) The intentional integration of trees with crops and livestock systems.
(D) The modern technological practice of growing commercial leafy crops hydroponically within controlled urban high-rise facilities.

**137.** Under the provisions of the Biological Diversity Act, 2002, state governments are required to establish State Biodiversity Boards. In which year was the Rajasthan State Biodiversity Board established?
(A) 2002
(B) 2005
(C) 2010
(D) 2014

**138.** Which of the following statements about the National Afforestation Programme (NAP) in India is incorrect?
(A) It strictly excludes the participation of local village communities in plantation drives.
(B) It is implemented through a decentralized mechanism involving Forest Development Agencies (FDA) and Joint Forest Management Committees (JFMCs).
(C) Its primary aim is the ecological restoration of degraded forests and adjoining areas.
(D) It emphasizes both ecological regeneration and livelihood improvement of forest-fringe communities.

**139.** The concept of "Ecosystem Services Valuation" is gaining importance in sustainable development. What does this process attempt to do?
(A) Determining the exact commercial market price at which public national parks and protected areas should be sold to private commercial developers.
(B) Valuing nature's benefits to ensure their inclusion in policy decisions.
(C) Calculating the exact total global cost of genetically modifying all agricultural food crops to permanently survive without any access to liquid water.
(D) Estimating the standardized legal financial penalty and fine imposed on municipalities for maintaining captive wild animals within modern urban zoological gardens.

**140.** The concept of "Planetary Boundaries" highlights the safe operating space for humanity with respect to the Earth system. Which of the following is recognized as a planetary boundary that has already been significantly transgressed by human activity?
(A) Stratospheric ozone layer depletion
(B) Biosphere integrity
(C) Global ocean acidification processes
(D) Freshwater and hydrological cycle use

www.nodia.in

Click Here to Buy book on Amazon

under the coverage of Project Tiger during its inaugural launch in 1973.

**37.** (A) It is dominated by dense evergreen forests and high annual rainfall.
Desert National Park in Rajasthan features hyper-arid climate conditions characterized by low annual precipitation, shifting sand dunes, craggy rock formations, and saline lake beds rather than dense evergreen forests. It covers extensive geographical areas across Jaisalmer and Barmer, functioning as a vital habitat for the endangered Great Indian Bustard and specialized desert adapted flora.

**38.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Sariska Tiger Reserve experienced a complete loss of its resident tiger population in 2004 primarily due to widespread illegal poaching combined with severe habitat encroachment. Following this ecological crisis, Indian wildlife authorities implemented pioneer tiger reintroduction programs by successfully relocating wild tigers from Ranthambore National Park to restore Sariska's apex predator ecosystem function.

**39.** (B) Ramgarh Vishdhari Wildlife Sanctuary
Ramgarh Vishdhari Wildlife Sanctuary, located in the Bundi district of Rajasthan, was officially notified as the state's fourth Tiger Reserve, expanding protected tiger corridors between Ranthambore and Mukundra Hills. The reserve provides crucial habitat connectivity, supporting wild tiger movement, biodiversity preservation, and landscape-level predator conservation across the region's semi-arid forest ecosystems.

**40.** (A) Ranthambore → Sariska → Mukundra Hills → Ramgarh Vishdhari
Rajasthan's tiger reserves were designated across different historical periods to enhance predator conservation. Ranthambore was declared a tiger reserve in 1973 under Project Tiger, followed by Sariska in 1978. Mukundra Hills was notified as the third reserve in 2013, while Ramgarh Vishdhari became the fourth designated tiger reserve, establishing critical ecological connectivity across protected forest landscapes.

**41.** (D) Conserving species within their natural ecosystems.
In-situ conservation refers to the on-site protection and preservation of biological species directly within their natural habitats and original ecological ecosystems. This strategy conserves entire communities alongside natural evolutionary processes. Standard examples of in-situ conservation infrastructure include designated national parks, wildlife sanctuaries, biosphere reserves, sacred groves, and protected community reserves.

**42.** (A) P-2, Q-3, R-1, S-4
Biosphere reserves exemplify in-situ conservation by protecting natural ecosystems in place. Ex-situ conservation removes biological material from natural settings, illustrated by the cryopreservation of gametes in specialized gene banks. Botanical gardens serve as primary ex-situ plant conservation facilities, whereas zoological parks provide controlled off-site care, management, and breeding programs for displaced animal species.

**43.** (C) 1973
Project Tiger was officially launched by the Government of India in April 1973 from Jim Corbett National Park. It stands as a landmark centrally sponsored conservation initiative designed to maintain viable wild tiger populations in their natural habitats, prevent tiger extinction, and protect forest ecosystems of strategic ecological importance across designated national tiger reserves.

**44.** (D) I, II, and III
Project Elephant was launched in 1992 as a Centrally Sponsored Scheme to ensure long-term survival of wild elephant populations. The project focuses on protecting wild Asian elephants, conserving their natural forest habitats, and securing crucial migratory corridors. Additionally, it addresses severe human-elephant conflicts and supports domestic welfare and veterinary care for captive elephants.

**45.** (A) Wildlife Sanctuaries - Ex-situ conservation
Wildlife Sanctuaries represent in-situ conservation methods because species are legally protected within their natural wild habitats alongside intact ecological processes. Sacred groves and national parks also function as primary in-situ conservation areas. Conversely,

NODIA

**9.** (D) Shannon-Wiener Index
The Shannon-Wiener Index is a widely accepted mathematical metric in community ecology used to quantify biodiversity within an ecosystem. It effectively incorporates both species richness, which counts the total number of species present, and species evenness, which measures the relative abundance of individuals belonging to each species in the sampled ecological community.

**10.** (B) Population → Community → Ecosystem → Biome
Biological organization follows a strict hierarchical order based on ecological complexity. A population consists of individuals of the same species in a shared area. Multiple interacting populations form a community. An ecosystem integrates living biological communities with their abiotic physical environment. Finally, a biome represents a massive geographic region characterized by distinct climate patterns and vegetation.

**11.** (B) Gland, Switzerland
The International Union for Conservation of Nature is a premier global environmental authority established in 1948 to assess the conservation status of biological species worldwide. Headquartered in Gland, Switzerland, the organization compiles and publishes the authoritative IUCN Red List of Threatened Species, guiding international conservation policies, habitat protection laws, and species recovery programs globally.

**12.** (B) I, II, and IV only
Habitat destruction and fragmentation remain the primary driver of global species extinctions. Overexploitation of biological resources directly led to the historical extinction of species such as Steller's sea cow. Co-extinction occurs when dependent obligate species perish alongside host organisms. Conversely, invasive alien species generally disrupt local food webs and reduce native biodiversity.

**13.** (A) It faces a very high risk of extinction in the wild in the near future.
The IUCN Red List system categorizes threatened biological species based on standardized quantitative risk criteria. A taxon is officially categorized as Endangered when quantitative assessments demonstrate that it faces a very high risk of extinction in the wild in the near future. Critically Endangered species face an extremely high extinction risk in the immediate future.

**14.** (C) Habitat loss and fragmentation
The phrase Evil Quartet describes four major ecological drivers causing widespread global biodiversity loss: habitat loss, overexploitation, alien species invasions, and co-extinctions. Among these factors, habitat loss and fragmentation caused by human urban expansion, agricultural clearing, and industrialization represents the single most significant and destructive driver causing rapid wildlife population declines worldwide.

**15.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The introduction of the predatory Nile Perch into Lake Victoria caused the ecological decimation and extinction of over two hundred endemic species of cichlid fish. Non-native alien species frequently thrive in newly introduced habitats because they lack natural predators, diseases, and competitors, allowing them to rapidly proliferate and aggressively outcompete vulnerable indigenous species for survival.

**16.** (C) Snow Leopard - Vulnerable
The Snow Leopard is classified as Vulnerable on the global IUCN Red List and inhabits high-altitude mountainous ecosystems across northern India. Meanwhile, the Great Indian Bustard is Critically Endangered due to habitat fragmentation and power line collisions. The Indian Wild Ass is Near Threatened, while the Asiatic Cheetah was officially declared Extinct in India during 1952.

**17.** (B) Milankovitch cycles
Milankovitch cycles refer to natural, long-term cyclical variations in the orbit, tilt, and precession of Earth, influencing global solar radiation distribution and climate patterns over thousands of years. Unlike agricultural expansion, industrial pollution, and wildlife poaching, Milankovitch cycles are purely astronomical processes and are not classified as direct anthropogenic drivers of modern biological species loss.

**18.** (D) Prosopis cineraria
Prosopis cineraria, locally known as Khejri, is a native indigenous tree of northwestern India, highly valued for ecological stabilization and

Downloaded from www.pdf.tube

agroforestry. In contrast, Lantana camara, Parthenium hysterophorus, and Eichhornia crassipes represent highly aggressive invasive exotic species that were historically introduced from outside regions, severely disrupting natural Indian terrestrial and aquatic ecosystems.

**19.** (A) Nitrogen and phosphorus
Eutrophication in aquatic ecosystems is primarily triggered by excessive nutrient enrichment, specifically nitrogen and phosphorus compounds derived from agricultural runoff and untreated sewage. High nutrient levels stimulate rapid growth of dense algal blooms. As algae decompose, aerobic bacteria consume dissolved oxygen, creating hypoxic conditions that lead to widespread mortality among fish and benthic organisms.

**20.** (A) II, I, III, IV
The IUCN Red List ranks threatened species along a continuum reflecting their risk of wild extinction. Arranged in decreasing order of extinction risk, the correct order moves from Critically Endangered, facing an extremely high extinction risk, to Endangered, then Vulnerable, and finally Near Threatened, which evaluated species that close to qualifying for threatened status.

**21.** (A) A resource that replenishes naturally over a short period.
A renewable resource is defined as a natural environmental asset that can naturally regenerate, replenish, or replace itself through biological cycles or natural physical processes within a short timeframe relative to human consumption rates. Solar radiation, wind energy, atmospheric oxygen, and managed forest biomass represent classic functional examples of naturally renewable environmental resources.

**22.** (D) P-2, Q-1, R-4, S-3
Inexhaustible renewable resources like solar energy cannot be depleted by human usage. Exhaustible renewable resources like groundwater replenish naturally but face depletion if extraction exceeds natural recharge. Recyclable non-renewable resources such as iron ore exist in finite quantities but can be repurposed. Non-recyclable non-renewable resources like fossil fuels deplete permanently upon chemical consumption.

**23.** (B) It requires prior central approval to divert forest land for non-forest purposes.
The Forest Conservation Act of 1980 was enacted to check unregulated deforestation and protect forest ecosystems across India. A pivotal provision mandates that state governments must obtain prior approval from the Central Government before diverting designated forest land for non-forest commercial, industrial, or infrastructure development activities, maintaining nationwide ecological balance and administrative oversight.

**24.** (C) 4
The Wild Life Protection Amendment Act of 2022 modernized Indian conservation governance by streamlining species protection frameworks. The amendment reduced the previous six legal schedules to four schedules. Schedules One and Two grant highest protection to threatened species, Schedule Three covers protected plant species, and Schedule Four incorporates international trade regulations under the CITES convention.

NODIA

**25.** (B) II and III only
Natural resource conservation aims at rational, sustainable management rather than total non-use or absolute preservation. It seeks to ensure sustainable yields from biological resources, allowing utilization while maintaining regenerative capabilities. Sustainable resource conservation provides for contemporary economic needs without compromising the capacity of future human generations to meet their resource demands.

**26.** (D) All of the above
Species classified under Schedule One of the Wildlife Protection Act enjoy the maximum level of legal protection in India. Any unauthorized actions including hunting, illegal poaching, commercial trade of body parts, and capture for public exhibition are strictly forbidden by law. Violations attract severe statutory penalties, mandatory imprisonment, and hefty fine structures to deter wildlife crimes.

**27.** (B) Biogas
Biogas is a renewable bio-energy source produced through the anaerobic digestion of biological matter such as agricultural waste, manure, and municipal organic waste. In contrast, coal, natural gas, and uranium represent exhaustible non-renewable resources formed over geological

timescales, which exist in finite global deposits and cannot naturally regenerate on human operational timelines.

**28.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
National Parks represent strictly protected areas established under the Wildlife Protection Act to conserve wildlife ecosystems and natural habitats. Destruction of wildlife habitats within national parks is completely illegal. To ensure maximum ecosystem protection, human activities such as commercial forestry, livestock grazing, private land rights, and human settlements are completely prohibited within park boundaries.

**29.** (A) Renewable biological resources
Maximum Sustainable Yield is a fundamental concept in biological resource management, particularly applicable to wild fisheries, forestry, and wildlife management. It defines the maximum theoretical crop or harvest that can be continuously extracted from a renewable biological population without causing long-term population decline or impairing the species' natural reproductive capacity and population replenishment.

**30.** (C) To integrate biodiversity conservation with sustainable development.
Biosphere Reserves established under UNESCO's Man and the Biosphere Programme aim to promote sustainable development grounded in local community efforts and scientific research. Unlike traditional strictly isolated national parks, Biosphere Reserves integrate ecosystem conservation with sustainable economic development, cultural heritage protection, scientific monitoring, environmental education, and collaborative resource management strategies.

**31.** (D) Core Zone
A Biosphere Reserve features three distinct functional zones designed to balance protection and utilization. The innermost Core Zone is strictly legally protected and dedicated exclusively to ecosystem conservation, prohibiting human disturbance apart from non-destructive scientific research and environmental monitoring. The surrounding Buffer Zone permits controlled educational activities, while the outer Transition Zone supports sustainable human settlements.

**32.** (B) I, II, and IV only
National Parks and Wildlife Sanctuaries are established under the Wildlife Protection Act. National Parks feature stricter legal protection where livestock grazing and private land ownership rights are completely barred. In sanctuaries, controlled grazing and certain private rights may be permitted by statutory authorities. However, sanctuaries can be upgraded to national parks, but national parks cannot be downgraded.

**33.** (B) Jim Corbett National Park
Jim Corbett National Park, established in 1936 as Hailey National Park in present-day Uttarakhand, holds the historic distinction of being India's first national park. The park was renamed to honor famous conservationist Jim Corbett and served as the initial launch location for Project Tiger in 1973, setting a benchmark for wildlife protection across India.

**34.** (D) P-3, Q-4, R-2, S-1
Desert National Park spans Jaisalmer and Barmer districts, representing a pristine desert landscape. Mukundra Hills Tiger Reserve covers parts of Kota and Chittorgarh districts. Keoladeo National Park is located in Bharatpur district, serving as a internationally acclaimed wetland habitat. Ranthambore National Park is situated in Sawai Madhopur district, famous for flagship tiger conservation efforts.

**35.** (A) Ramsar Convention
Keoladeo National Park, situated in Bharatpur, Rajasthan, is a world-renowned wetland ecosystem celebrated for its rich avifauna and migratory waterfowl populations. It was officially designated as a wetland of international importance under the international Ramsar Convention in 1981 and is also listed as a prestigious UNESCO Natural World Heritage Site for biodiversity conservation.

**36.** (C) It is located at the junction of the Aravalli and Vindhya hill ranges.
Ranthambore National Park is geographically situated at the strategic ecological confluence of two ancient mountain systems: the Aravalli and Vindhya ranges in Rajasthan. Famous for its thriving Bengal tiger population and dry deciduous forest vegetation, Ranthambore was among the original protected areas brought

Click Here to Buy book on Flipkart

**127.** Biomagnification is a significant threat to apex predators, particularly birds of prey. Which of the following is a classic consequence of the biomagnification of DDT in predatory birds?
(A) Uncontrolled increase in their body size.
(B) Improved night vision aiding in hunting.
(C) Immediate mortality from respiratory failure upon inhaling the chemical.
(D) Thinning of eggshells leading to reproductive failure.

**128.** Find the odd one out with respect to the trophic levels in a typical terrestrial ecosystem.
(A) Autotrophic primary producers
(B) Herbivorous primary consumers
(C) Abiotic factors
(D) Carnivorous secondary consumers

**129.** A "genetic bottleneck" can severely threaten a species' survival. Which statement incorrectly describes a genetic bottleneck?
(A) It occurs when a population's size is drastically reduced for at least one generation.
(B) It leads to a significant increase in the genetic diversity of the surviving population.
(C) It can make the recovering population more susceptible to diseases due to lack of genetic variation.
(D) It is often caused by catastrophic environmental events or severe overhunting.

**130.** Scientists warn that Earth is currently undergoing the "Sixth Mass Extinction." What is the defining difference between this current event and the previous five mass extinctions?
(A) The current mass extinction event is driven primarily by an unprecedented massive asteroid impact.
(B) The current mass extinction event is caused exclusively by widespread and sustained global volcanic activity.
(C) The current mass extinction event exclusively affects marine organisms while leaving terrestrial biomes completely untouched.
(D) It is driven by human activities and occurring at a much faster rate.

**131.** In the wake of the Bhopal Gas Tragedy, the Government of India enacted a comprehensive umbrella legislation for environmental protection. In which year was the Environment (Protection) Act passed?
(A) 1972
(B) 1981
(C) 1986
(D) 1992

**132.** The National Green Tribunal (NGT) was established in India to ensure effective and expeditious disposal of cases relating to environmental protection. Which of the following Acts does NOT fall under the jurisdiction of the NGT?
(A) The Water (Prevention and Control of Pollution) Act, 1974
(B) The Forest (Conservation) Act, 1980
(C) The Wildlife (Protection) Act, 1972
(D) The Biological Diversity Act, 2002

NODIA

**133.** Which of the following statements is correct regarding the Kunming-Montreal Global Biodiversity Framework (GBF) adopted at COP 15?
(A) It set the "30 by 30" target to conserve 30% of Earth's land and oceans by 2030.
(B) It completely dissolved and replaced the foundational 1992 Convention on Biological Diversity treaty structure.
(C) It legally binds all participating nations to permanently halt national economic growth to protect wild biodiversity.
(D) It is a unilateral trade and conservation framework strictly imposed by the European Union on developing global South nations.

**134.** Which of the following is NOT classified as a renewable energy source for promoting sustainable development?
(A) Solar photovoltaic power systems
(B) Onshore and offshore wind turbines
(C) Small scale hydroelectric power plant
(D) Shale gas extraction

**135.** Match List I with List II and select the correct option.

**List I: (International Commitment)**
P. Achieving the Sustainable Development Goals (SDGs)
Q. India's target for Net Zero Carbon Emissions
R. Kunming-Montreal "30x30" biodiversity target
S. Land Degradation Neutrality Target under UNCCD

**List II: (Target Year)**
1. 2030
2. 2070
3. 2030
4. 2030

tissue culture laboratories, botanical gardens, seed banks, and zoological parks operate as off-site ex-situ facilities maintaining biological specimens under human supervision.

**46.** (C) Biosphere reserves
Biosphere reserves represent in-situ conservation strategies, protecting entire wild ecosystems, natural ecological processes, and resident biological communities within their original geographic habitats. In contrast, crop seed banks, botanical arboretums, aquariums, and zoological gardens are classified as ex-situ conservation facilities because organisms or genetic resources are maintained in artificial off-site human environments.

**47.** (D) To run captive breeding programs for endangered species.
Modern zoological parks serve vital conservation functions far beyond public recreation. Their principal ecological mandate focuses on running scientific captive breeding programs for threatened species, supporting ex-situ genetic management, conducting research, and fostering public environmental awareness. Captive bred animals can eventually be reintroduced into restored natural habitats to reinforce dwindling wild wildlife populations.

**48.** (C) Elephants
The Monitoring the Illegal Killing of Elephants program, abbreviated as MIKE, is an international treaty monitoring system established under the Convention on International Trade in Endangered Species. MIKE provides standardized ecological data to measure trends in elephant poaching, evaluate management interventions, and support international cooperation aimed at ensuring long-term wild elephant conservation.

**49.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
When natural habitats suffer severe destruction, fragmentation, or irreversible degradation, ex-situ conservation becomes the sole viable survival option for critically threatened species. Removing organisms from immediate natural threats enables direct human intervention through controlled veterinary care, specialized nutrition, and scientific captive breeding to prevent immediate species extinction and build reserve populations.

NODIA

**50.** (D) Pusa National Gene Bank
The Pusa National Gene Bank is an ex-situ conservation facility where genetic material, seeds, and tissues are stored in controlled artificial environments off-site. Conversely, Nilgiri Biosphere Reserve, Agasthyamalai Hills, and Nanda Devi National Park represent in-situ conservation areas where wild species and natural ecological processes are preserved directly within their native habitats.

**51.** (A) Chennai
The Biological Diversity Act of 2002 was enacted by the Parliament of India to implement the provisions of the United Nations Convention on Biological Diversity. The National Biodiversity Authority, an autonomous statutory body established under this legislative framework in 2003, maintains its official headquarters in Chennai, Tamil Nadu, supervising national biodiversity governance.

**52.** (A) I, II, and III only
The Biological Diversity Act establishes a decentralized three-tier structure comprising national, state, and local entities to regulate access to biological resources and facilitate equitable benefit sharing. Foreign individuals or entities require prior approval from the National Biodiversity Authority. However, local Indian citizens and traditional healers are exempt from restrictions regarding traditional usage.

**53.** (A) Biodiversity Management Committee
Under the Biological Diversity Act of 2002, local self-governing bodies establish Biodiversity Management Committees within their jurisdictions. A primary mandate of these committees involves documenting local biological resources, traditional knowledge, and ecological usage through the compilation of People's Biodiversity Registers, safeguarding community intellectual property rights and promoting sustainable natural resource management.

**54.** (D) The Brundtland Report (Our Common Future)
The landmark definition of sustainable development was formally introduced in 1987 by the World Commission on Environment and Development in its seminal report entitled Our Common Future, commonly known as the Brundtland Report. The report defined it as development meeting present needs without

# ANSWERS

**1.** (B) Genetic diversity
Genetic diversity represents the fundamental level of biological organization referring to the total variety of genetic information contained within individuals of a single species. It includes differences in individual genes, chromosomes, and alleles. High genetic diversity is critical for overall species adaptability, natural evolutionary processes, and long-term population survival under changing environmental conditions.

**2.** (D) I, II, and III
Biological diversity is measured at multiple spatial scales to understand ecological structures. Alpha diversity quantifies the species richness existing within a specific local habitat or community. Beta diversity evaluates the turnover or change in species composition between different ecosystems. Gamma diversity measures the overall species diversity recorded across a broad geographic region containing multiple distinct habitats.

**3.** (A) Eastern Ghats
Biodiversity hotspots are globally designated regions characterized by exceptional levels of endemic plant species paired with severe habitat destruction. India contains four recognized hotspots: the Himalayas, the Western Ghats, Indo-Burma, and Sundaland. The Eastern Ghats region features significant forest biodiversity but lacks official recognition as a distinct global biodiversity hotspot.

**4.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The Western Ghats mountain range is globally recognized as a critical biodiversity hotspot due to its extraordinary species richness and high concentration of endemic flora and fauna. Hotspot status specifically requires a region to possess over fifteen hundred endemic vascular plant species while suffering a loss of at least seventy percent of its original habitat.

**5.** (A) The Himalayan hotspot covers only the western parts of the Himalayan range.
The Himalayan biodiversity hotspot encompasses the entire Indian Himalayan region, spanning across both western and eastern sections, including Nepal, Bhutan, and parts of northeastern India. India is recognized among seventeen megadiverse countries worldwide due to high species richness, high endemism, and diverse ecosystems. Sundaland includes India's Nicobar Islands, reflecting immense marine and terrestrial ecological importance.

**6.** (D) P-3, Q-4, R-1, S-2
Endemic species are geographically restricted to specific defined locations. Keystone species exert disproportionately massive structural impacts on their ecological communities relative to their abundance. Exotic species represent organisms introduced outside their native evolutionary ranges, whereas flagship species are charismatic target organisms chosen to symbolize public conservation campaigns, environmental awareness, and habitat preservation projects globally.

**7.** (B) Nutrient cycling and soil formation
Ecosystem services derived from biodiversity are categorized into direct provisioning goods and indirect functional services. Direct provisioning products include timber, firewood, medicinal plants, resins, and gums harvested for direct human usage. In contrast, nutrient cycling and soil formation represent fundamental indirect supporting ecosystem services necessary for sustaining broader ecological functions and overall environmental stability.

**8.** (C) Norman Myers
British ecologist Norman Myers formally introduced the concept of biodiversity hotspots in 1988 to identify biogeographic regions with extreme endemic plant species presence combined with severe threats of habitat degradation. This concept was later refined and expanded by Conservation International to prioritize global conservation funding, habitat protection initiatives, and critical ecosystem preservation strategies worldwide.

Downloaded from www.pdf.tube

**64.** (C) Global warming is expected to uniformly increase the species richness of all terrestrial ecosystems.
Global warming does not uniformly increase species richness across ecosystems; rather, it threatens vulnerable habitats, triggering biodiversity loss and localized extinctions. Climate change alters geographical distributions, forcing species toward polar latitudes or higher altitudes. Healthy ecosystems demonstrate superior climate resilience, whereas deforestation impairs natural carbon sequestration capacity, compounding global climate instability.

**65.** (B) SDG 2 - Zero Hunger
Sustainable Development Goal Two explicitly aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture globally. Among other targets, SDG Four focuses on Quality Education, SDG Seven ensures Affordable and Clean Energy, SDG Eight targets Decent Work and Economic Growth, and SDG Eleven promotes Sustainable Cities and Communities.

**66.** (D) Substantially reducing youth unemployment, lack of education, or training.
Sustainable Development Goal Thirteen explicitly addresses Climate Action, requiring nations to strengthen resilience against climate hazards, integrate climate strategies into national policies, and improve environmental education. Substantially reducing youth unemployment and expanding job training opportunities represent direct targets under SDG Eight, which focuses on Decent Work and Economic Growth rather than climate action.

**67.** (A) By causing ocean acidification, reducing carbonate ions for shell formation.
Elevated atmospheric carbon dioxide levels lead to increased absorption of $CO_2$ by ocean surface waters, reacting with seawater to form carbonic acid and causing ocean acidification. This reduction in ocean pH drastically decreases available carbonate ions, impairing the ability of corals, mollusks, and planktonic organisms to build and maintain calcium carbonate structures.

**68.** (A) I, II, and III only
Local communities contribute effectively to sustainable forest management by guarding against illegal timber smuggling, applying traditional ecological knowledge for rotational grazing, and detecting forest fires early. Conversely, unrestricted commercial logging for immediate village revenue generation causes rapid forest degradation, contradicting the principles of community-based conservation and long-term ecosystem sustainability.

**69.** (A) Phenology
Phenology is the scientific study of periodic biological life cycle events and how these events are influenced by seasonal atmospheric variations and climate conditions. Key phenological phenomena include the timing of plant flowering, leaf emergence, bird migration, insect emergence, and animal hibernation. Climate change significantly alters these natural phenological schedules across global ecosystems.

**70.** (A) Formation of Forest Protection Committee → Signing MoU with Forest Dept → Preparation of Micro-plan → Implementation & Benefit Sharing
Establishing a Joint Forest Management program follows a structured sequential process at the village level. It begins with forming a local Forest Protection Committee, followed by signing a formal Memorandum of Understanding with the state Forest Department. Next, a participatory Micro-plan is drafted, leading to cooperative field implementation and equitable usufruct benefit sharing.

NODIA

**71.** (B) A habitat strip connecting wildlife populations separated by human activities.
A wildlife corridor is a continuous or stepped physical strip of natural habitat that connects isolated wildlife populations separated by human infrastructure, agriculture, or urban development. By reconnecting fragmented landscapes, corridors facilitate animal movement, seasonal migrations, gene flow between populations, and long-term species survival in increasingly altered regional environments.

**72.** (A) I and II only
Wildlife corridors perform critical ecological functions by enabling seasonal migrations of large mammals and promoting gene flow between fragmented populations, thereby mitigating inbreeding depression. However, because corridors consist of linear habitat strips, they naturally feature high perimeter-to-area ratios, which increases edge effects rather than completely eliminating them.

**73.** (A) 1971
The Convention on Wetlands of International Importance, commonly known as the Ramsar Convention, is an intergovernmental treaty signed on February 2, 1971, in the Iranian city of Ramsar. The convention provides an international framework for national action and international cooperation regarding the conservation and wise sustainable use of wetland habitats worldwide.

**74.** (A) Adding an Indian site to it requires a constitutional amendment by Parliament.
The Montreux Record is an international register under the Ramsar Convention listing wetland sites facing ecological changes due to pollution or human interference. Adding an Indian site requires administrative assessment and executive notification rather than a parliamentary constitutional amendment. Keoladeo National Park in Rajasthan remains listed on the Montreux Record.

**75.** (B) Sambhar Salt Lake and Keoladeo National Park
Rajasthan currently features two internationally recognized Ramsar wetland sites: Keoladeo National Park in Bharatpur district and Sambhar Salt Lake located across Jaipur, Nagaur, and Ajmer districts. Designated under the Ramsar Convention, these unique aquatic ecosystems support vital migratory waterfowl populations, rare wetland flora, and critical arid habitat ecological processes.

**76.** (B) The Edge effect
The edge effect describes changes in population structures or community dynamics that occur at the boundary where two distinct habitats meet. Narrow wildlife corridors possess high perimeter-to-area ratios, exposing traveling species to altered microclimates, increased predation, and human disturbances characteristic of the surrounding modified landscape rather than interior core forests.

**77.** (A) High-yield extraction of fossil fuels
Wetlands deliver vital ecosystem services including natural flood control, storm buffering, groundwater recharge, and water purification through sediment and toxin filtration. Their function in filtering pollutants earned them the description as natural landscape kidneys. In contrast, the high-yield commercial extraction of fossil fuels represents an extractive industrial activity rather than an ecological wetland service.

**78.** (D) I, II, III, and IV
The Ramsar Convention establishes specific ecological criteria for identifying wetlands of international importance. A wetland qualifies if it represents a rare natural wetland type, regularly supports over twenty thousand waterbirds, harbors threatened biological species, or serves as a critical food source, spawning site, nursery, or migration route for fish populations.

**79.** (D) It is India's largest inland saline lake and key flamingo habitat.
Sambhar Salt Lake is India's largest inland saline lake, situated in central Rajasthan. This unique wetland ecosystem is internationally recognized under the Ramsar Convention due to its specialized saline ecology and vast seasonal aggregations of migratory birds, serving as a primary feeding and breeding habitat for thousands of flamingos and waterfowl.

**80.** (A) III, I, II, IV
A wetland ecosystem exhibits distinct ecological zonation moving from deep aquatic areas to dry terrestrial land. The open water zone forms the deepest region, followed by the submergent zone where rooted aquatic plants remain completely underwater. Next is the emergent zone featuring rooted plants extending above water, ending in the upland riparian transition zone.

**81.** (B) Khejri (Prosopis cineraria)
In 1730, Amrita Devi Bishnoi led 363 members of the Bishnoi community in Khejarli village, Rajasthan, who sacrificed their lives to protect sacred Khejri trees from being felled by royal soldiers. This historic sacrifice highlights the community's profound cultural dedication to forest conservation and directly inspired modern environmental movements like Chipko.

**82.** (C) I and III only
Gene banks and seed banks operate as off-site ex-situ conservation facilities designed to preserve genetic diversity and traditional crop landraces against agricultural homogenization. However, seed viability requires storing seeds under strictly controlled low-temperature and low-humidity dry conditions, as high humidity and warmth accelerate seed decay and premature germination.

Click Here to Buy book on Amazon

**83.** (C) -196°C
Cryopreservation is an advanced ex-situ conservation method involving the preservation of biological materials, such as seeds, pollen, cells, and gametes, at ultra-low temperatures in liquid nitrogen at minus 196 degrees Celsius. At this temperature, metabolic activity and cellular division halt completely, enabling long-term storage of genetic material without degradation.

**84.** (C) Cumulative knowledge and beliefs developed by indigenous peoples over generations.
Traditional Ecological Knowledge refers to the cumulative body of local knowledge, practices, and beliefs concerning relationships between living beings and their environment. Developed over generations by indigenous communities through direct environmental interaction, this knowledge system offers valuable insights for sustainable resource management, biodiversity conservation, seasonal climate adaptation, and local ecosystem restoration.

**85.** (A) It is designed to be highly vulnerable to climate change and rising sea levels.
The Svalbard Global Seed Vault is built deep inside a permafrost mountain on a remote Norwegian Arctic archipelago, specifically designed to withstand natural disasters, rising sea levels, and severe climate impacts. It serves as a secure global backup facility, safeguarding duplicates of crop seeds conserved in gene banks worldwide against catastrophic loss.

**86.** (D) Orans - Rajasthan
Orans represent traditional sacred groves and community-conserved pastures dedicated to local deities across the arid landscape of Rajasthan. In contrast, Devarakadus are sacred groves situated in Karnataka, Kavus represent sacred forest patches in Kerala, and the famous sacred groves of the Khasi Hills are located in Meghalaya rather than other regions.

**87.** (B) They act as refugia for rare species lost in surrounding degraded landscapes.
Sacred groves are community-protected forest patches preserved through traditional cultural beliefs and spiritual taboos. From an ecological perspective, these groves function as indispensable biological refugia, conserving rare endemic flora, medicinal plants, and wild fauna that have disappeared from surrounding altered landscapes, while safeguarding regional hydrological balance and localized topsoil integrity.

**88.** (B) I, III, and IV only
The Biological Diversity Act requires prior approval from the National Biodiversity Authority for intellectual property applications based on Indian biological resources. It protects local traditional knowledge through People's Biodiversity Registers and explicitly exempts local traditional practitioners from statutory access permits. However, it mandates sharing commercial benefits directly with local communities.

**89.** (D) Biosphere Reserves
Orans of Rajasthan, Kavus of Kerala, and Devrais of Maharashtra represent traditional community-managed sacred groves protected through local cultural and religious traditions. In contrast, Biosphere Reserves represent modern, government-notified protected area frameworks established under state statutory legislation and international environmental programs, making them distinct from community-led sacred groves.

**90.** (A) Guaranteeing immediate high crop yields for current farmers.
Agricultural seed banks serve as vital ex-situ repositories that preserve traditional crop landraces, safeguard rare genetic material, and mitigate catastrophic crop failures. While seed banks supply valuable traits for scientific plant breeding programs, they do not directly guarantee immediate high commercial yields for contemporary farmers during daily agricultural production.

NODIA

**91.** (B) The United Nations Conference on Environment and Development (Earth Summit), 1992
The United Nations Convention on Biological Diversity was officially opened for signature at the historic United Nations Conference on Environment and Development, popularly known as the Rio Earth Summit, in June 1992. Entering into force in 1993, this landmark international treaty establishes comprehensive global goals for biodiversity conservation, sustainable resource use, and fair benefit sharing.

**111.** (D) Camel
In 2014, the Government of Rajasthan officially designated the Camel as the State Animal under the livestock category to enhance camel protection, curb population declines, and support traditional desert pastoral livelihoods. Concurrently, the Chinkara, or Indian Gazelle, retains its official status as the State Animal within the wildlife protection category.

**112.** (C) Blackbuck
Tal Chhapar Sanctuary, located in the Churu district of Rajasthan, features a unique flat saline depression ecosystem dominated by open grasslands. The sanctuary is nationally renowned as a premier protection habitat for large herds of Blackbuck antelopes, while also hosting migratory raptors, desert foxes, and diverse arid grassland bird species.

**113.** (B) It is renowned for the presence of the elusive flying squirrel.
Sita Mata Wildlife Sanctuary, situated in the Pratapgarh district of Rajasthan, is famous for harboring rare biodiversity, including the elusive Indian Giant Flying Squirrel. Featuring dense deciduous forests and rich floral diversity, it serves as a critical conservation habitat, contrasting with the hyper-arid sand dune landscapes found in western desert districts.

**114.** (D) Jawai Bandh area
The Jawai Bandh area in Pali district, Rajasthan, is nationally recognized as a specialized leopard conservation reserve rather than a full national park. Celebrated for its unique granite rock landscape, Jawai supports a thriving wild leopard population coexisting harmoniously with local pastoral Rabari communities in an unconventional human-dominated landscape.

**115.** (A) National Chambal Sanctuary - Chambal River
The National Chambal Sanctuary is a famous tri-state protected riverine corridor situated along the Chambal River across Rajasthan, Madhya Pradesh, and Uttar Pradesh. It serves as a vital conservation sanctuary for critically endangered gharials, marsh crocodiles, vulnerable Gangetic dolphins, and diverse migratory aquatic bird species reliant on pristine riverine ecosystems.

**116.** (C) It acts as a buffer between protected areas, involving community consultation.
Under the Wildlife Protection Act, a Conservation Reserve is declared by state governments on government-owned land, often adjacent to national parks or sanctuaries. It functions as a buffer zone or ecological corridor, integrating community consultation through a management committee to preserve habitat integrity while accommodating local community developmental needs.

**117.** (A) It has been declared the state's fifth Tiger Reserve.
The Dholpur-Karauli area was officially approved and notified as the fifth Tiger Reserve of Rajasthan. Encompassing forested riverine habitats along the Chambal basin, this reserve enhances habitat connectivity, expands protected tiger territory, and strengthens apex predator conservation initiatives alongside Ranthambore, Sariska, Mukundra Hills, and Ramgarh Vishdhari reserves.

**118.** (D) A sacred grove dedicated to a local deity where tree cutting is forbidden.
An Oran is a traditional sacred grove and community-managed pasture land dedicated to local folk deities in Rajasthan. Within these sacred spaces, local social norms strictly prohibit tree cutting and habitat destruction, turning Orans into vital biodiversity refuges that conserve indigenous flora, rainwater harvesting structures, and wildlife in dry ecosystems.

**119.** (B) It is a natural biosphere reserve characterized by dense alpine forests.
Machia Biological Park, located near Jodhpur around Kaylana Lake, operates as a modern ex-situ zoological facility and wildlife enclosure rather than a natural alpine biosphere reserve. Rajasthan lacks alpine biomes entirely. Machia Biological Park contributes to public environmental education, wildlife rehabilitation, and captive conservation of indigenous desert species.

**120.** (C) Collisions with high-tension power transmission lines.
The Great Indian Bustard faces imminent extinction primarily due to fatal collisions with overhead high-tension power transmission lines across its remaining desert habitats in Rajasthan. Due to poor frontal vision and heavy

Downloaded from www.pdf.tube

long-term agricultural sustainability and ecological balance.

**102.** (D) It applies water directly to roots, reducing evaporation and percolation losses.
Drip irrigation represents a highly efficient sustainable water management method that delivers water directly to crop root zones in precise, controlled quantities. Compared to traditional flood irrigation, drip systems dramatically minimize evaporation, soil erosion, and deep percolation losses, substantially increasing agricultural water-use efficiency in arid regions like Rajasthan.

**103.** (B) It relies on crop rotation, compost, and biological pest control for soil health.
Organic farming relies on holistic ecological principles, utilizing natural compost, green manure, systematic crop rotation, and biological pest management to sustain soil fertility and manage crop pests. It strictly excludes synthetic chemical fertilizers, artificial pesticides, and genetically modified organisms, promoting long-term agricultural soil health, biodiversity preservation, and ecological balance.

**104.** (C) Surangam
Tankas, Johads, and Baoris represent celebrated traditional rainwater harvesting structures developed across Rajasthan to harvest surface runoff and groundwater. In contrast, Surangam is a traditional water harvesting system consisting of horizontal excavation cave wells, uniquely practiced in the Western Ghats region of Kerala and Karnataka rather than Rajasthan.

**105.** (D) Jaisalmer
The Khadin system is an ingenious traditional runoff water management and agricultural technique developed by the Paliwal Brahmins in the fifteenth century. Practiced extensively in the hyper-arid Jaisalmer district of Rajasthan, it collects monsoon runoff in low-lying farmland, enabling crop cultivation in dry desert soils using retained soil moisture.

**106.** (A) P-2, Q-1, R-4, S-3
A Tanka is an underground cylindrical cistern constructed for storing harvested rainwater. A Johad functions as an earthen check dam designed to capture surface runoff and recharge groundwater. Khadins serve as specialized agricultural runoff harvesting systems in arid tracts, whereas Baoris represent intricate architectural stepwells reaching groundwater reserves.

**107.** (B) By combining biological, cultural, and chemical tools to minimize ecological and health risks.
Integrated Pest Management is a sustainable agricultural strategy that combines biological control, crop rotation, resistant varieties, and targeted, minimal chemical interventions. Rather than aiming for total chemical pest eradication, IPM maintains pest populations below economically damaging thresholds while minimizing environmental pollution, human health risks, and impacts on non-target organisms.

**108.** (B) Surface flood irrigation
Surface flood irrigation is an inefficient traditional method characterized by excessive water consumption, high evaporation, and potential topsoil erosion. In contrast, overhead sprinklers, sub-surface drip lines, and micro-sprayers represent modern micro-irrigation systems designed to maximize water-use efficiency, conserve groundwater, and optimize agricultural water application in dry regions.

NODIA

**109.** (A) To improve soil structure, break pest cycles, and replenish nutrients like nitrogen.
Crop rotation involves growing different crop types sequentially on the same land across seasons. Incorporating legumes in rotation fixes atmospheric nitrogen, enriching soil fertility naturally. This practice improves soil structure, disrupts pest and disease life cycles, reduces reliance on synthetic chemical inputs, and enhances long-term agricultural soil productivity and sustainability.

**110.** (C) It is only effective in regions that receive continuous rainfall throughout the year.
Rainwater harvesting is exceptionally valuable in arid and semi-arid regions that experience seasonal or erratic rainfall. It effectively recharges groundwater aquifers, mitigates topsoil erosion from monsoonal runoff, and provides a decentralized water source during dry seasons. Therefore, claiming that rainwater harvesting functions effectively only in continuously wet regions is incorrect.

**92.** (B) Safe handling and use of Living Modified Organisms (LMOs) from modern biotechnology.
The Cartagena Protocol on Biosafety is an international environmental agreement supplementary to the Convention on Biological Diversity. It specifically regulates the safe transfer, handling, and transboundary movement of Living Modified Organisms resulting from modern biotechnology, ensuring protection against potential adverse impacts on global biological diversity, ecological stability, and human health.

**93.** (A) It explicitly mandates the complete cessation of all commercial research on biological resources.
The Nagoya Protocol is a supplementary agreement to the Convention on Biological Diversity that provides a transparent legal framework for Access and Benefit-Sharing. It acknowledges indigenous traditional knowledge rights without banning commercial research. Instead, it ensures that benefits derived from commercial genetic resource utilization are shared fairly with provider communities.

**94.** (C) Land degradation in drylands resulting from climatic variations and human activities.
In the context of arid landscapes like the Thar Desert, desertification refers to land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities like overgrazing, deforestation, and unsustainably intensive agriculture, which reduces soil productivity and impairs ecosystem functions.

**95.** (D) Great Indian Bustard (Godawan)
The Great Indian Bustard, locally known as Godawan, is the official State Bird of Rajasthan. Classified as Critically Endangered on the IUCN Red List, this large terrestrial bird faces imminent extinction due to extreme habitat loss, hunting, and fatal collisions with high-tension power lines across its remaining arid grassland habitats.

**96.** (C) It fixes atmospheric nitrogen to enrich soil and provides drought fodder.
Prosopis cineraria, commonly known as Khejri, is crucial for desert ecosystems and agriculture in arid Rajasthan. Its deep root system accesses deep groundwater without competing with surface crops. Furthermore, it enriches soil fertility by fixing atmospheric nitrogen, yields essential fodder during drought, and stabilizes fragile desert soils against wind erosion.

**97.** (B) P-2, Q-3, R-4, S-1
The Chinkara holds official status as Rajasthan's state animal in the wildlife category. The Desert Fox represents a specialized carnivorous mammal adapted to arid environments. The Spiny-tailed Lizard operates as a herbivorous desert reptile, while the Godawan, or Great Indian Bustard, serves as the recognized State Bird of Rajasthan.

**98.** (D) Xerophytes
Plants such as Euphorbia and Opuntia that inhabit hyper-arid desert environments exhibit specialized morphological and physiological adaptations, including fleshy water-storing stems, reduced leaf surface areas, thick cuticles, and sunken stomata. These drought-adapted plants are ecologically categorized as xerophytes, enabling survival under extreme water scarcity and high ambient temperatures.

**99.** (A) 20 global targets to halt biodiversity loss adopted under CBD for 2011–2020.
The Aichi Biodiversity Targets comprised twenty specific global targets organized under five strategic goals, adopted under the Convention on Biological Diversity in 2010. Designed for the 2011 to 2020 framework, these targets aimed to halt global biodiversity loss, promote sustainable resource use, safeguard ecosystems, and enhance community benefits.

**100.** (C) Sundari (Heritiera fomes)
Sundari represents a specialized mangrove tree species naturally restricted to coastal estuarine environments, such as the Sundarbans delta. In contrast, Rohida, Kair, and Phog constitute iconic native xerophytic species naturally adapted to the hyper-arid Thar Desert of Rajasthan, featuring structural adaptations to withstand severe drought and high solar radiation.

**101.** (A) Monocropping reliant on synthetic chemical fertilizers.
Continuous monocropping dependent on heavy synthetic chemical fertilizers directly opposes the ecological principles of sustainable agriculture. This practice degrades soil structure, causes chemical runoff, disrupts natural soil biota, and increases vulnerability to pests. Conversely, integrated pest management, crop rotation, polyculture, and conservation tillage promote

Click Here to Buy book on Flipkart

body weight, these large birds cannot avoid power lines during flight, making power line installation the most urgent direct threat.

**121.** (D) A species with a disproportionately large effect on ecosystem structure and function.
A keystone species exerts a disproportionately massive impact on its natural ecological community structure, species diversity, and ecosystem function relative to its physical abundance. The removal or extinction of a keystone species causes dramatic cascade effects, altering food webs and potentially transforming the whole surrounding physical and biological ecosystem.

**122.** (A) A state where a species is naturally restricted to one specific geographic location.
Endemism describes a biological state where a species is naturally restricted and native to a specific, defined geographic area, such as an island, mountain range, or distinct ecosystem, and found nowhere else globally. High endemism paired with severe habitat degradation is a defining criterion for designating global biodiversity hotspots.

**123.** (B) A transition zone between two biological communities displaying high species richness.
An ecotone is a physical transition boundary between two distinct biological communities, such as a forest and a grassland or terrestrial and aquatic ecosystems. Ecotones often feature environmental conditions from both adjoining habitats, exhibiting high species diversity and abundance—a ecological phenomenon officially referred to as the edge effect.

**124.** (B) Biological nitrogen fixation by bacteria
Ecosystem services are classified into provisioning, regulating, supporting, and cultural services. Cultural ecosystem services encompass non-material benefits including aesthetic appreciation, ecotourism, spiritual enrichment, and educational value derived from natural environments. In contrast, biological nitrogen fixation represents a supporting ecological service essential for nutrient cycling and primary ecosystem production.

**125.** (A) National Heritage Animal
The Indian Elephant was officially declared the National Heritage Animal of India in 2010 by the Ministry of Environment, Forest and Climate Change. This designation emphasizes the elephant's ecological importance as a umbrella species, its cultural heritage significance, and the need for heightened legal protection and corridor conservation across India.

**126.** (C) P-2, Q-1, R-4, S-3
Edward O. Wilson popularized the general term biodiversity in conservation biology. Norman Myers introduced the concept of global biodiversity hotspots. Robert Whittaker defined the spatial diversity metrics of alpha, beta, and gamma diversity. Carl Linnaeus established binomial nomenclature, creating the modern standardized biological classification system for naming living organisms.

**127.** (D) Thinning of eggshells leading to reproductive failure.
Biomagnification involves the increasing concentration of persistent, non-biodegradable synthetic chemicals like DDT at higher trophic levels in food chains. In predatory birds, high DDT concentrations disrupt calcium metabolism, resulting in severe eggshell thinning. Fragile eggshells break prematurely during incubation, causing drastic population declines and widespread reproductive failures among apex birds.

**128.** (C) Abiotic factors
Trophic levels categorize living organisms within an ecological food web based on their energy acquisition roles. Autotrophic producers form the first level, herbivorous primary consumers occupy the second level, and carnivorous secondary consumers form upper levels. Abiotic factors represent non-living physical components, making them distinct from biotic trophic levels.

**129.** (B) It leads to a significant increase in the genetic diversity of the surviving population.
A genetic bottleneck occurs when a population undergoes a drastic reduction in size due to environmental disasters, habitat loss, or overhunting. This severe reduction significantly decreases genetic diversity rather than increasing it. The resulting small population suffers from inbreeding, reduced adaptability, and heightened vulnerability to disease and environmental change.

Downloaded from www.pdf.tube

# CHAPTER 12

# Economic Importance of Animals and Plants

**1.** Economically important plants are broadly classified into food, medicinal, and industrial categories based on their primary utility. Which of the following best defines an industrial plant?
(A) A plant exclusively grown in greenhouses for commercial export
(B) A plant cultivated primarily to yield raw materials for manufacturing processes
(C) A plant whose primary economic value lies in its direct consumption by humans
(D) A genetically modified plant engineered to resist industrial chemical pollutants

**2.** Among the economically important plants, which of the following is strictly classified as a forage or fodder crop rather than a primary human food crop?
(A) Triticum aestivum (Wheat)
(B) Oryza sativa (Rice)
(C) Sorghum bicolor (Jowar) when harvested specifically before grain maturity for cattle
(D) Cicer arietinum (Chickpea)

**3.** Which of the following statements accurately differentiates between medicinal plants and industrial plants?
(A) Medicinal plants only yield secondary metabolites, whereas industrial plants only yield primary metabolites.
(B) Industrial plants are always woody trees, while medicinal plants are strictly herbaceous.
(C) Industrial plants are wild-harvested, whereas medicinal plants are always cultivated in agricultural fields.
(D) Medicinal plants are valued for pharmacologically active compounds, while industrial plants provide bulk raw materials like latex, fibers, or timber.

**4.** In the botanical classification of food crops, cereals belong to which of the following plant families?
(A) Fabaceae
(B) Solanaceae
(C) Poaceae
(D) Brassicaceae

**5.** Legumes (pulses) are highly valued in agriculture not only for their protein-rich seeds but also for their agronomic benefits. What is their primary ecological role in a crop rotation system?
(A) They deplete essential soil nutrients, forcing farmers to apply organic manure.
(B) They harbor symbiotic Rhizobium bacteria in root nodules to fix nitrogen.
(C) They secrete specialized root exudates that eliminate common soil pathogens.
(D) They serve as effective trap crops that divert mammalian pests away from cereals.

**6.** Identify the incorrect statement regarding major oilseed crops.
(A) Mustard is a major rabi oilseed crop in Rajasthan.
(B) Groundnut develops its pods below the soil surface through a process called pegging.
(C) Soybean is considered both a pulse and an oilseed due to its high protein and oil content.
(D) Castor oil is widely used as a direct cooking oil in standard Indian households.

**7.** Consider the following statements regarding major food crops:
I. Rice requires high temperatures and high humidity with standing water during its early growth stage.
II. Wheat is a kharif crop in India, requiring heavy rainfall during the ripening stage.
III. Millets like Bajra are well-adapted to the arid and semi-arid regions of Rajasthan.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

NODIA

ensures that ecosystem values are incorporated into sustainable development policies and cost-benefit planning.

**140.** (B) Biosphere integrity
The Planetary Boundaries framework defines critical Earth system thresholds within which humanity can safely operate. Scientists confirm that several boundaries have already been significantly transgressed due to human activity, most notably biosphere integrity, which encompasses biodiversity loss and species extinction rates, alongside climate change, nitrogen cycles, and land-system changes.

www.nodia.in

Click Here to Buy book on Amazon

**130.** (D) It is driven by human activities and occurring at a much faster rate.
Unlike the previous five mass extinction events in Earth's history, which were caused by natural geological and astronomical catastrophes like asteroid impacts and volcanic eruptions, the ongoing sixth mass extinction is driven by human activities. Accelerated by habitat destruction, pollution, climate change, and overexploitation, extinction rates are occurring exponentially faster.

**131.** (C) 1986
Following the catastrophic Bhopal Gas Tragedy of 1984, the Parliament of India enacted the comprehensive Environment Protection Act in 1986. Serving as an overarching umbrella legislation under Article 253 of the Constitution, it empowers the central government to coordinate environmental protection, control industrial pollution, and establish strict ecological standards nationwide.

**132.** (C) The Wildlife (Protection) Act, 1972
The National Green Tribunal, established under the National Green Tribunal Act of 2010, handles civil cases involving environmental protection and forest conservation. Its jurisdiction covers major laws including the Water Act, Air Act, Forest Conservation Act, and Biological Diversity Act, but explicitly excludes the Wildlife Protection Act and Indian Forest Act.

**133.** (A) It set the "30 by 30" target to conserve 30% of Earth's land and oceans by 2030.
The Kunming-Montreal Global Biodiversity Framework was adopted at COP 15 in 2022 under the Convention on Biological Diversity. A key flagship commitment is the 30 by 30 target, which aims to effectively conserve and restore at least 30 percent of Earth's terrestrial, inland water, coastal, and marine areas by 2030.

**134.** (D) Shale gas extraction
Shale gas extraction involves extracting fossil natural gas trapped in deep subterranean rock formations through hydraulic fracturing. Like coal and petroleum, shale gas is a non-renewable fossil fuel resource that releases carbon emissions upon combustion. Conversely, solar photovoltaics, wind turbines, and small hydroelectric plants generate clean, renewable energy.

**135.** (B) P-1, Q-2, R-3, S-4
Global environmental frameworks establish key target years for action. Achieving the Sustainable Development Goals is targeted for 2030. India committed to achieving Net Zero carbon emissions by 2070 at COP 26. The Kunming-Montreal Framework targets 30 percent biodiversity protection by 2030, matching UNCCD's target year for Land Degradation Neutrality.

**136.** (C) The intentional integration of trees with crops and livestock systems.
Agroforestry is a sustainable land management approach that intentionally integrates woody perennials, such as trees and shrubs, with agricultural crops and livestock on the same land management unit. This system enhances biodiversity, improves soil fertility, optimizes microclimates, diversifies farm income, and increases overall ecological resilience against climatic extremes.

**137.** (C) 2010
Following the enactment of the national Biological Diversity Act of 2002, the Government of Rajasthan notified the Rajasthan Biological Diversity Rules and officially established the Rajasthan State Biodiversity Board in 2010. Headquartered in Jaipur, the Board promotes conservation, sustainable utilization, and equitable benefit-sharing regarding biological resources across Rajasthan.

NODIA

**138.** (A) It strictly excludes the participation of local village communities in plantation drives.
The National Afforestation Programme is a flagship centrally sponsored scheme designed for ecological restoration of degraded forests and adjacent areas. Implemented through a decentralized structure involving Forest Development Agencies and Joint Forest Management Committees, the programme actively centers on local community participation, combining environmental regeneration with rural livelihood enhancement.

**139.** (B) Valuing nature's benefits to ensure their inclusion in policy decisions.
Ecosystem Services Valuation is an economic and environmental framework that measures the economic, social, and ecological value provided by natural ecosystem functions. By quantifying benefits such as carbon sequestration, water purification, and pollination, this process

**8.** The active chemical compound 'Azadirachtin', known for its potent insecticidal and medicinal properties, is commercially extracted from which of the following plants?
(A) Azadirachta indica (Neem)
(B) Ocimum sanctum (Tulsi)
(C) Withania somnifera (Ashwagandha)
(D) Aloe barbadensis (Aloe Vera)

**9.** Ashwagandha (Withania somnifera) is an economically vital medicinal plant. Which part of the Ashwagandha plant is predominantly harvested for its therapeutic active principles?
(A) Leaves
(B) Flowers
(C) Roots
(D) Stem bark

**10.** Match the medicinal plants in List I with their primary active compounds in List II.
**List I: (Medicinal Plant)**
P. Tulsi
Q. Cinchona
R. Ashwagandha
S. Turmeric
**List II: (Active Compound)**
1. Quinine
2. Eugenol
3. Curcumin
4. Withanolide
Which of the following represents the correct combination?
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-1, S-3

**11.** Tulsi (Ocimum sanctum) holds significant medicinal value in traditional Indian medicine. Which of the following therapeutic properties is most commonly associated with Tulsi extracts?
(A) Powerful general anesthetic
(B) Strong purgative and laxative action
(C) Primary cure for genetic blood disorders like thalassemia
(D) Immunomodulatory and expectorant properties

**12.** Plant fibers are classified based on their anatomical origin. Cotton fibers are economically important textile raw materials. Botanically, what is the origin of the cotton fiber?
(A) Bast fibers from the stem
(B) Epidermal hairs of the seed coat
(C) Leaf fibers from the mesophyll tissue
(D) Xylem fibers from the central wood

**13.** The extraction of jute fiber involves a biological process where bundled jute stems are submerged in slow-running water to allow microorganisms to dissolve the pectin holding the fibers together. What is this process called?
(A) Scutching
(B) Ginning
(C) Decortication
(D) Retting

**14.** Which of the following fiber-yielding plants is correctly matched with the specific type of fiber it produces?
(A) Jute - Bast fiber
(B) Flax - Coir
(C) Cotton - Leaf fiber
(D) Coconut - Phloem fiber

**15.** Consider the following statements regarding fiber-yielding plants:
I. Cotton requires a frost-free period of about 210 days for optimal growth.
II. Jute is predominantly cultivated in the arid regions of western Rajasthan.
III. Flax yields a high-quality fiber known commercially as linen.
IV. Coir is extracted from the mesocarp of the coconut fruit.
Which of the above statements is/are correct?
(A) I, II, and III
(B) I, III, and IV
(C) II, III, and IV
(D) I, II, and IV

**16.** Natural rubber, an essential industrial raw material, is primarily obtained from the latex of Hevea brasiliensis. To make the raw rubber durable, elastic, and less sticky, it undergoes a chemical process using sulfur. What is this process called?
(A) Polymerization
(B) Galvanization
(C) Saponification
(D) Vulcanization

**17.** Resins are economically valuable plant exudates used in varnishes, adhesives, and incense. Which of the following tree species is a major commercial source of natural resin (turpentine and rosin) in India?
(A) Tectona grandis (Teak)

Downloaded from www.pdf.tube

**37.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Apiculture provides significant secondary economic benefits to agriculture beyond the sale of honey and wax.
**Reason (R):** Foraging worker bees are highly effective cross-pollinators, thereby increasing the crop yield of surrounding agricultural fields.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**38.** Pisciculture primarily involves the controlled breeding and rearing of fishes. What distinguishes the modern practice of 'Aquaculture' from traditional 'Pisciculture'?
(A) Pisciculture is restricted to freshwater bodies, whereas aquaculture deals exclusively with coastal marine zones.
(B) Pisciculture focuses on finfish, while aquaculture includes all aquatic species like shellfish and water plants.
(C) Aquaculture relies on harvesting wild oceanic stocks, whereas pisciculture focuses on inland wild river catches.
(D) Both terms describe identical management practices and carry the exact same scope in agricultural science.

**39.** In commercial pisciculture, a technique called 'composite fish culture' or 'polyculture' is highly recommended. What is the fundamental principle behind this practice?
(A) Farming complementary fish species occupying different feeding zones in one pond to optimize yield.
(B) Raising a single predatory fish species under controlled conditions to maximize dominant market biomass.
(C) Combining marine and freshwater species in brackish estuaries to induce rapid genetic adaptability.
(D) Keeping fish in closed indoor tanks fed with commercial diets, bypassing natural pond ecosystems entirely.

**40.** Match the types of fish culture in List I with their corresponding definitions in List II.
**List I: (Type of Fishery)**
P. Capture Fishery
Q. Inland Fishery
R. Marine Fishery
S. Culture Fishery
**List II: (Definition)**
1. Rearing fish in coastal waters and open oceans
2. Harvesting fish naturally available in water bodies
3. Cultivating fish in confined water bodies under controlled conditions
4. Fishery operations conducted in freshwater rivers, lakes, and ponds
Which of the following represents the correct combination?
(A) P-2, Q-4, R-1, S-3
(B) P-3, Q-1, R-4, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-2, Q-1, R-4, S-3

**41.** Induced breeding is a revolutionary technique in modern pisciculture that ensures the timely availability of pure fish seed. This process typically involves the injection of an extract derived from which gland of a donor fish?
(A) Thyroid gland
(B) Adrenal gland
(C) Pancreas
(D) Pituitary gland

**42.** Lac is a natural resin of significant commercial importance used in varnishes, sealing waxes, and cosmetics. From which biological source is commercial lac obtained?
(A) It is an exudate directly secreted by the bark of the Palash tree when cut.
(B) It is secreted by special glands of the female lac insect (Kerria lacca) as a protective covering.
(C) It is the hardened fecal matter of the male lac insect.
(D) It is a sap produced by the roots of the Kusum tree during the monsoon season.

**43.** Successful lac cultivation depends heavily on the availability of specific host trees. Which of the following is NOT a recognized major host tree for rearing lac insects?
(A) Butea monosperma (Palash)
(B) Ziziphus mauritiana (Ber)
(C) Schleichera oleosa (Kusum)
(D) Mangifera indica (Mango)

NODIA

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

animal does this breed belong, and what is its primary utility?
(A) Cow; meat production
(B) Goat; fine quality wool
(C) Sheep; draft purposes
(D) Buffalo; high milk yield

**28.** Which of the following correctly pairs a domestic animal with its primary commercial meat product?
(A) Goat - Chevon
(B) Sheep - Venison
(C) Pig - Mutton
(D) Cattle - Poultry

**29.** Consider the following statements regarding the role of domestic animals in Rajasthan:
I. The Rathi breed of cattle is highly valued for milk production in the arid regions of Rajasthan.
II. Sheep rearing in Rajasthan is exclusively focused on meat production, with no contribution to the wool industry.
III. Goat is often referred to as the "poor man's cow" due to its ability to survive on sparse vegetation while providing milk and meat.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**30.** Sericulture is the science of rearing silkworms for the commercial production of silk. Which species of silkworm is responsible for the majority of commercial silk production globally?
(A) Antheraea mylitta
(B) Philosamia ricini
(C) Antheraea assamensis
(D) Bombyx mori

**31.** The mulberry silkworm is monophagous in its feeding habits. What is the primary botanical name of the plant whose leaves form the exclusive diet of this silkworm?
(A) Morus alba
(B) Ricinus communis
(C) Terminalia arjuna
(D) Machilus bombycina

**32.** In the sericulture industry, the process of killing the pupa inside the cocoon without damaging the continuous silk thread is a critical step before reeling. What is this process called?
(A) Moulting
(B) Stifling
(C) Hatching
(D) Spinning

**33.** Select the correct sequential order of the four developmental stages in the life cycle of the silkworm.
(A) Egg → Pupa → Larva (Caterpillar) → Adult Moth
(B) Egg → Larva (Caterpillar) → Pupa → Adult Moth
(C) Larva (Caterpillar) → Egg → Pupa → Adult Moth
(D) Pupa → Larva (Caterpillar) → Egg → Adult Moth

**34.** Apiculture refers to the scientific rearing of honey bees. Which of the following species of honey bee is most widely domesticated in India for commercial honey production due to its high yield and docile nature?
(A) Apis dorsata (Rock bee)
(B) Apis florea (Little bee)
(C) Apis mellifera (European bee)
(D) Apis cerana indica (Indian hive bee)

**35.** Honey is a highly valued economic product of apiculture. What gives natural honey its extremely long shelf life and resistance to microbial spoilage?
(A) High internal moisture levels combined with elevated alkaline pH values.
(B) Low osmotic tension alongside complete absence of active digestive enzymes.
(C) High sugar content creating high osmotic pressure along with low acidic pH.
(D) Natural accumulation of trace heavy metals derived directly from floral nectar.

**36.** In a honey bee colony, what is the primary biological and economic function of the worker bees?
(A) To lay abundant fertile eggs and rapidly expand total colony population size.
(B) To mate directly with the fertile queen bee during seasonal nuptial flights.
(C) To remain inactive in comb cells, functioning solely as winter food reserves.
(D) To gather nectar and pollen, build wax combs, and tend developing larvae.

Click Here to Buy book on Flipkart

**86.** Arrange the correct sequence of the fundamental steps involved in processing raw wool into yarn.
(A) Shearing → Scouring → Sorting → Carding → Spinning
(B) Scouring → Shearing → Carding → Sorting → Spinning
(C) Shearing → Sorting → Scouring → Spinning → Carding
(D) Sorting → Shearing → Scouring → Carding → Spinning

**87.** In the context of wool processing, what does the step 'Scouring' specifically refer to?
(A) Cutting the fleece from the live sheep
(B) Washing the raw wool with detergents to remove grease (lanolin), dirt, and sweat
(C) Aligning the wool fibers into a continuous, parallel web
(D) Twisting the aligned wool fibers to form a strong yarn

**88.** Agroforestry models offer numerous economic and ecological benefits. Which of the following is considered a major ecological benefit of integrating trees into agricultural landscapes?
(A) Rapid depletion of groundwater tables due to deep tree roots
(B) Complete elimination of native wildlife species
(C) Reduction of soil erosion and improvement of microclimate
(D) Increased dependency on synthetic chemical fertilizers

**89.** 'Silvopasture' is a prominent agroforestry model. What are the key components integrated into a silvopastoral system?
(A) Agricultural crops + Fish farming
(B) Trees + Agricultural crops + Fish
(C) Trees + Forage/Pasture grasses + Livestock
(D) Fruit orchards + Beekeeping

**90.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Agroforestry acts as an effective strategy for climate change mitigation in the agricultural sector.
**Reason (R):** The woody perennial trees integrated into the agroforestry system sequester significant amounts of atmospheric carbon dioxide in their biomass and soils.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**91.** In India, the concept of organic farming is strongly supported by the use of botanical pesticides. Which part of the Neem plant is crushed to extract neem oil, heavily used as an organic insecticide?
(A) Roots
(B) Bark
(C) Seeds/Kernels
(D) Leaves

**92.** Consider the following statements regarding the economic importance of plants and animals:
I. Coir is derived from the outer husk (mesocarp) of the coconut fruit and is highly resistant to saltwater.
II. The Central Sheep and Wool Research Institute (CSWRI) is located at Avikanagar in Rajasthan.
III. Pebrine is a devastating viral disease that exclusively affects honey bees.
IV. The Gir breed is considered one of the best indigenous milch breeds of cattle in India.
Which of the above statements is/are correct?
(A) I, II, and III
(B) I, II, and IV
(C) II, III, and IV
(D) I, III, and IV

NODIA

**93.** Identify the incorrect pair regarding the commercially useful plant product and its primary application.
(A) Linseed oil - Manufacturing of paints and varnishes
(B) Castor oil - High-quality industrial lubricant
(C) Mentha (Mint) extract - Pharmaceutical and flavoring agent
(D) Eucalyptus oil - Edible cooking medium

**94.** The dairy industry categorizes milk into $A_1$ and $A_2$ types based on genetics. What specific component of milk differentiates $A_1$ milk from $A_2$ milk?
(A) The lactose concentration
(B) The type of beta-casein protein present
(C) The percentage of milk fat
(D) The amount of calcium and phosphorus

**44.** Consider the following statements regarding the processing of raw lac:
I. Raw lac scraped from the branches is known as sticklac.
II. When sticklac is crushed and washed to remove impurities and insect bodies, it becomes seedlac.
III. Seedlac is heated, melted, and stretched into thin sheets to produce commercial shellac.
IV. India is completely dependent on imports for its domestic lac consumption.
Which of the above statements is/are correct?
(A) I, II, and IV
(B) II, III, and IV
(C) I, II, and III
(D) I, III, and IV

**45.** In the context of the poultry industry, commercial bird flocks are distinctly categorized based on their output. What is the technical term for poultry birds reared specifically for maximum meat production in a short duration?
(A) Broilers
(B) Layers
(C) Pullets
(D) Cockerels

**46.** The 'Deep Litter System' is widely considered a highly efficient method in commercial poultry farming. What characterizes this system?
(A) Birds are housed continuously in automated multi-tier cage systems equipped with mechanical egg-collection belts.
(B) Birds are kept on litter-covered floors where bedding mixes with droppings to yield valuable organic manure.
(C) Birds range freely across open outdoor pastures without permanent structural enclosures or wire housing.
(D) Birds are managed in aquatic holding ponds designed to minimize exposure to common terrestrial parasites.

**47.** Kadaknath is a famous indigenous breed of poultry originating from Madhya Pradesh and widely reared in parts of Rajasthan. What is the unique economic trait that makes Kadaknath highly sought after?
(A) It exhibits the highest annual egg production rate recorded among native Indian chicken varieties.
(B) It produces nutrient-dense black meat characterized by high protein and low fat and cholesterol.
(C) It yields premium commercial down feathers extensively harvested for thermal winter outerwear.
(D) It maintains baseline metabolism without supplemental feed by relying on ambient atmospheric moisture.

NODIA

**48.** Identify the incorrect statement regarding common diseases affecting the poultry industry.
(A) Ranikhet disease (Newcastle disease) is a highly contagious viral disease in chickens.
(B) Fowlpox causes nodular lesions on the unfeathered skin of birds.
(C) Coccidiosis is a parasitic disease affecting the intestinal tract of poultry.
(D) Anthrax is the most common cause of mass mortality in commercial broiler chickens.

**49.** India holds a strong position in the global export of certain medicinal plants. Which of the following medicinal crops, extensively cultivated in the arid regions of Rajasthan and Gujarat, is a major agricultural export due to its use as a natural laxative (psyllium husk)?
(A) Senna (Cassia angustifolia)
(B) Isabgol (Plantago ovata)
(C) Safed Musli (Chlorophytum borivilianum)
(D) Guggal (Commiphora wightii)

**50.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The cultivation of medicinal plants like Safed Musli and Aloe Vera has gained massive popularity among farmers in Rajasthan.
**Reason (R):** These medicinal crops are well-adapted to arid and semi-arid climates, require less water compared to traditional cereals, and offer higher market returns.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**51.** The National Medicinal Plants Board (NMPB) was established by the Government of India to coordinate all matters relating to medicinal plants. Under which Union Ministry does the NMPB operate?
(A) Ministry of Agriculture and Farmers Welfare
(B) Ministry of Environment, Forest and Climate

III. Vermicomposting relies heavily on the digestive processes of specific earthworm species.
IV. Chemical pesticides enhance the survival and efficiency of biofertilizers in the soil.
Which of the above statements is/are correct?
(A) I, II, and III
(B) II, III, and IV
(C) I, III, and IV
(D) I, II, and IV

**71.** The leather industry relies heavily on the proper initial preservation of raw animal hides to prevent putrefaction before tanning. What is the most common traditional method used for 'curing' raw hides?
(A) Boiling the hides in water for 24 hours
(B) Coating the hides heavily with wet common salt (salting)
(C) Exposing the hides directly to intense ultraviolet radiation
(D) Storing the hides in concentrated sulfuric acid

**72.** Rajasthan has historically held a dominant position in India's wool industry. Which breed of sheep, native to the Shekhawati region of Rajasthan, is often renowned as the "Indian Merino" due to the fine quality of its carpet wool?
(A) Marwari
(B) Malpura
(C) Chokla
(D) Sonadi

**73.** Identify the odd one out from the following list of breeds based on the animal species they belong to.
(A) Magra
(B) Pugal
(C) Nali
(D) Tharparkar

**74.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The economy of the arid western districts of Rajasthan relies heavily on livestock rearing, particularly sheep and goat, rather than intensive crop agriculture.
**Reason (R):** Sheep and goats are highly resilient to drought conditions, capable of surviving on sparse, degraded pastures where commercial crop cultivation is unviable.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**75.** Wildlife tourism represents a major economic asset. In ecological economics, what does the concept of 'Carrying Capacity' refer to in the context of a wildlife sanctuary?
(A) The peak commercial revenue and financial profits a park can yield in a single fiscal year.
(B) The physical vehicle limit that internal sanctuary roads can safely accommodate during peak hours.
(C) The threshold of human presence and facilities an ecosystem can support without degradation.
(D) The cumulative biomass measurement of all resident wild animal species inside reserve borders.

**76.** Which of the following is considered a direct economic benefit of maintaining healthy wildlife populations and protected areas (like Ranthambore or Sariska)?
(A) Commercial harvesting of prime forest timber to supply national building and construction demands.
(B) Economic revenue and regional jobs created via eco-tourism and allied hospitality operations.
(C) Land clearance within natural habitats to accommodate expanding municipal and urban settlements.
(D) Live trapping of apex predators for commercial trade with international wildlife sanctuaries.

**77.** The National Medicinal Plants Board (NMPB) focuses on various aspects of the medicinal plant sector. Which of the following falls under the 'Ex-situ conservation' strategy promoted by NMPB?
(A) Preserving vulnerable medicinal flora directly within undisturbed native forest environments.
(B) Cultivating plant species in botanical gardens located outside their natural habitats.
(C) Imposing complete statutory bans on international commercial trade of traditional herbal drugs.
(D) Granting unrestricted foraging access rights

Downloaded from www.pdf.tube

(B) Tecomella undulata (Rohida)
(C) Azadirachta indica (Neem)
(D) Prosopis juliflora (Vilayati Babool)

**63.** Identify the correct sequence of fundamental steps generally followed in the industrial tanning of animal hides to produce finished leather.
(A) Tanning → Curing → Flaying → Finishing
(B) Flaying → Curing → Pre-tanning → Tanning → Finishing
(C) Finishing → Tanning → Pre-tanning → Curing → Flaying
(D) Curing → Flaying → Tanning → Pre-tanning → Finishing

**64.** Biotechnology has drastically altered agricultural economics. What specific trait was introduced into the first commercially approved transgenic crop in India, Bt Cotton?
(A) Resistance to broad-spectrum herbicides
(B) Enhanced Vitamin A content in the seeds
(C) Resistance to bollworm insect pests
(D) Increased tolerance to severe soil salinity

**65.** Plant tissue culture (micropropagation) offers immense economic advantages over traditional vegetative propagation. Which of the following is the most prominent commercial advantage of this biotechnology?
(A) Rapid mass production of disease-free, clone-like plantlets in a limited timeframe.
(B) Complete independence from soil substrate and irrigation across the entire adult plant lifecycle.
(C) Induction of spontaneous, unpredictable genetic mutations throughout consecutive plant generations.
(D) Total absence of specialized laboratory facility requirements, allowing open outdoor field cultivation.

**66.** Biofertilizers are living microorganisms applied to seeds, plant surfaces, or soil to promote growth. Which of the following biofertilizers is commonly used in paddy (rice) fields due to its symbiotic relationship with the water fern Azolla?
(A) Rhizobium
(B) Azotobacter
(C) Blue-Green Algae (Cyanobacteria)
(D) Mycorrhiza

**67.** Mycorrhizae represent a symbiotic association between plant roots and beneficial fungi. From an agricultural and economic perspective, what is the primary benefit of inoculating soils with mycorrhizal fungi?
(A) They synthesize potent herbicidal compounds that selectively suppress surrounding weed species.
(B) They improve root surface area to increase plant uptake of soil phosphorus and moisture.
(C) They perform rapid fixation of free atmospheric nitrogen into usable nitrate ions for crop growth.
(D) They induce complete systemic immunity against a broad spectrum of destructive plant viruses.

**68.** Match the terms in List I with their descriptions in List II.
**List I: (Term)**
P. Transgenic Crop
Q. Biofertilizer
R. Biopesticide
S. Vermicompost
**List II: (Description)**
1. Organic manure produced using earthworms
2. A crop containing genes artificially inserted from another species
3. Formulations containing naturally occurring pathogenic microorganisms to control pests
4. Preparations containing live microorganisms that enhance soil nutrient availability

Which of the following represents the correct combination?
(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-3, R-4, S-1
(D) P-1, Q-4, R-2, S-3

NODIA

**69.** Organic farming severely restricts the use of synthetic chemicals. Which of the following organisms is widely utilized in organic farming as a biological control agent (biopesticide) specifically against plant fungal diseases?
(A) Bacillus thuringiensis
(B) Trichoderma viride
(C) Ladybird beetle
(D) Azospirillum

**70.** Consider the following statements regarding microorganisms in organic farming:
I. Rhizobium bacteria form root nodules exclusively in leguminous plants to fix nitrogen.
II. Azotobacter is a free-living nitrogen-fixing bacterium useful for non-leguminous crops like wheat.

Change
(C) Ministry of AYUSH
(D) Ministry of Commerce and Industry

**52.** Which of the following states is the largest producer of mustard (a major vegetable oil-yielding plant) in India, significantly contributing to the edible oil economy?
(A) Punjab
(B) Madhya Pradesh
(C) Rajasthan
(D) Uttar Pradesh

**53.** Soybean (Glycine max) is a globally significant crop. What is the approximate composition of protein and oil in a typical mature soybean seed, respectively?
(A) 20% protein and 40% oil
(B) 40% protein and 20% oil
(C) 10% protein and 50% oil
(D) 50% protein and 10% oil

**54.** Groundnut (Arachis hypogaea) cultivation relies on a unique botanical phenomenon crucial for its economic yield. What is this phenomenon called, where the flower stalk elongates and pushes the fertilized ovary into the soil to develop the pod?
(A) Vernalization
(B) Phototropism
(C) Pegging
(D) Stratification

**55.** Aromatic plants are cultivated primarily for the extraction of essential oils used in perfumes, cosmetics, and flavoring. Which of the following methods is most commonly used industrially to extract essential oils from aromatic crops like lemongrass and mint?
(A) Steam distillation
(B) Cold pressing
(C) Centrifugation
(D) Lyophilization (Freeze-drying)

**56.** Spices and condiments are vital agricultural commodities. Botanically, what is the economically useful part of the Clove (Syzygium aromaticum) plant used as a spice?
(A) Dried seed
(B) Dried flower bud
(C) Inner bark
(D) Dried rhizome

**57.** Rajasthan is famously known as the hub of "Seed Spices" in India. Which of the following groups of spices represents the major seed spices extensively cultivated in Rajasthan?
(A) Black pepper, Cardamom, Clove
(B) Coriander, Cumin, Fenugreek
(C) Turmeric, Ginger, Garlic
(D) Cinnamon, Nutmeg, Mace

**58.** Saffron (Kesar), one of the most expensive spices in the world, is derived from which specific part of the Crocus sativus flower?
(A) Petals
(B) Sepals
(C) Stigmas and styles
(D) Anthers

**59.** Consider the following statements regarding vegetable oil-yielding plants:
I. Mustard is predominantly grown as a Kharif crop in Rajasthan.
II. Groundnut is a leguminous crop that helps in soil nitrogen fixation.
III. Soybean extraction yields both high-quality vegetable oil and a protein-rich meal used for animal feed.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**60.** Arrange the correct sequential order of the fundamental steps involved in the processing of raw turmeric rhizomes to produce commercial dry turmeric spice.
(A) Boiling → Drying → Polishing → Colouring
(B) Drying → Boiling → Polishing → Colouring
(C) Polishing → Boiling → Drying → Colouring
(D) Colouring → Polishing → Drying → Boiling

**61.** Khejri (Prosopis cineraria) is a socio-economically crucial tree in Rajasthan. Apart from fodder and fuel, what is the specific local name for the highly nutritious pod of the Khejri tree, which is consumed as a vegetable?
(A) Sangri
(B) Kummat
(C) Ker
(D) Lasoda

**62.** Which of the following tree species found in Rajasthan is historically the primary commercial source of 'Gum Arabic', a resin heavily used in the food and pharmaceutical industries?
(A) Acacia senegal (Kummat)

Click Here to Buy book on Amazon

to indigenous communities in biosphere reserves.

**78.** Which of the following institutions is correctly paired with its location in Rajasthan, playing a vital role in research supporting the arid economy (agriculture, forestry, or livestock)?
(A) Central Sheep and Wool Research Institute (CSWRI) - Jodhpur
(B) Central Arid Zone Research Institute (CAZRI) - Avikanagar
(C) Arid Forest Research Institute (AFRI) - Jodhpur
(D) National Research Centre on Camel (NRCC) - Jaipur

**79.** Camel rearing is deeply intertwined with the culture and economy of Rajasthan. The best-known draft and riding camel breed of Rajasthan, famous for its speed and agility, primarily belongs to which region?
(A) Bikaner
(B) Jaisalmer
(C) Mewar
(D) Hadoti

**80.** Consider the following statements regarding the economic importance of the camel in Rajasthan:
I. Camel milk is increasingly recognized for its therapeutic properties, being rich in Vitamin C and beneficial for diabetes management.
II. Camel hair is utilized in traditional rural industries for making carpets, blankets, and ropes.
III. The population of camels in Rajasthan has been steadily increasing over the last two decades due to widespread mechanization of agriculture.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**81.** The scientific name of the single-humped Arabian camel, which is the species prevalent in Rajasthan, is:
(A) Camelus dromedarius
(B) Camelus bactrianus
(C) Lama glama
(D) Vicugna pacos

**82.** Which of the following accurately describes the primary distinction between 'Ecotourism' and conventional 'Mass Tourism'?
(A) Ecotourism relies on constructing commercial high-density resort complexes directly within core wilderness areas.
(B) Ecotourism promotes sustainable travel that conserves natural ecosystems and supports local community welfare.
(C) Ecotourism prioritizes short-term foreign exchange earnings without regard for long-term ecological impact.
(D) Mass tourism strictly limits total entry numbers, while ecotourism promotes unrestricted visitor entry.

**83.** The Government of Rajasthan launched the 'Rajasthan Ecotourism Policy' to systematically harness the state's natural heritage. In which year was the current comprehensive Rajasthan Ecotourism Policy released?
(A) 2010
(B) 2015
(C) 2021
(D) 2023

**84.** Which of the following is NOT an intended positive outcome of biodiversity-based tourism (ecotourism)?
(A) Creation of alternative livelihood opportunities for forest-fringe communities
(B) Increased public awareness regarding wildlife conservation
(C) Habituation of wild animals to human feeding, making them docile
(D) Generation of funds directly allocated to protected area management

**85.** Agroforestry is a sustainable land management system. Which of the following best defines the 'Agrisilviculture' model?
(A) Growing food crops and forest trees together on the same land unit.
(B) Managing livestock alongside improved pasture grasses without incorporating woody tree species.
(C) Raising specialized agricultural food crops exclusively within controlled freshwater aquatic systems.
(D) Establishing pure monoculture timber plantations on degraded government wasteland parcels.

NODIA

(B) Dalbergia sissoo (Shisham)
(C) Pinus roxburghii (Chir Pine)
(D) Azadirachta indica (Neem)

**18.** Essential oils (volatile oils) are distinct from fatty oils (fixed oils) because they evaporate at room temperature and carry distinct aromas. Which of the following plants is primarily cultivated for its industrial essential oil rather than a fatty edible oil?
(A) Eucalyptus globulus (Eucalyptus)
(B) Helianthus annuus (Sunflower)
(C) Brassica juncea (Mustard)
(D) Arachis hypogaea (Groundnut)

**19.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Unprocessed natural latex rubber is not suitable for manufacturing automobile tires.
**Reason (R):** Unprocessed natural rubber is highly sensitive to temperature changes, becoming brittle in winter and sticky in summer.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**20.** Non-Timber Forest Products (NTFPs) play a crucial role in tribal economies. Which of the following is NOT classified as a Non-Timber Forest Product?
(A) Tendu leaves
(B) Sal seeds
(C) Mahua flowers
(D) Teak logs

**21.** Tendu leaves are of significant economic importance in specific regions of India, including southern Rajasthan. What is the primary commercial use of Tendu leaves?
(A) Extraction of industrial dyes
(B) Wrapping material for bidi manufacturing
(C) Essential raw material for the paper industry
(D) Production of organic bio-plastics

**22.** Identify the correct sequence of the traditional gum tapping process from trees.
(A) Bark blazing/incision → Exudation of sap → Drying and hardening → Harvesting
(B) Exudation of sap → Drying and hardening → Bark blazing/incision → Harvesting
(C) Harvesting → Bark blazing/incision → Drying and hardening → Exudation of sap
(D) Drying and hardening → Exudation of sap → Bark blazing/incision → Harvesting

**23.** Bamboo is an economically vital forest resource often referred to as "green gold." Under the amended Indian Forest Act, 1927 (amended in 2017), how is bamboo grown in non-forest areas legally classified?
(A) Timber tree
(B) Endangered species
(C) Noxious weed
(D) Grass

**24.** Domestic animals are generally classified into milch breeds, draught breeds, and dual-purpose breeds based on their utility. What defines a 'draught breed' of cattle?
(A) Breeds whose dairy females are reared specifically for high commercial milk yield.
(B) Breeds whose males are well suited for agricultural draft work and transport.
(C) Breeds whose livestock are selected primarily for rapid commercial meat yield.
(D) Breeds whose specialized lineage allows extended survival without surface water.

**25.** Which of the following cattle breeds of Rajasthan is famous nationwide primarily as a powerful draught breed?
(A) Sahiwal
(B) Gir
(C) Rathi
(D) Nagauri

**26.** In the classification of economically important animals, the term 'poultry' technically encompasses which of the following groups of domesticated birds?
(A) Domesticated birds like chickens, ducks, and turkeys raised for meat or eggs.
(B) Commercial avian flocks consisting exclusively of chickens kept for egg output.
(C) Wild forest game species such as pheasants hunted for sport and meat harvest.
(D) Large flightless species like ostriches kept exclusively for feather production.

**27.** The Murrah breed is of tremendous economic importance in India's dairy sector. To which

Downloaded from www.pdf.tube

**95.** 'Golden Rice' was developed through genetic engineering primarily to combat a specific nutritional deficiency common in developing nations. What does Golden Rice contain in enhanced amounts?
(A) Vitamin C
(B) Beta-carotene (Pro-vitamin A)
(C) Iron and Zinc
(D) Essential amino acids

**96.** Which of the following is considered an exception to the typical characteristics of pulses (legumes)?
(A) They generally possess a deep taproot system.
(B) They invariably deplete the soil of nitrogen, requiring heavy urea application.
(C) They are considered a major source of dietary protein for vegetarians.
(D) Their fruit is botanically classified as a pod or legume.

**97.** Identify the crop that is economically classified primarily as a 'Millet' (coarse cereal) and forms a staple diet in the dry regions of Rajasthan.
(A) Pennisetum glaucum (Bajra)
(B) Hordeum vulgare (Barley)
(C) Zea mays (Maize)
(D) Triticum durum (Macaroni wheat)

**98.** Match the institutions in List I with their locations in List II.
**List I: (Institution)**
P. National Research Centre on Camel
Q. Central Institute for Research on Buffaloes
R. Central Arid Zone Research Institute
S. National Dairy Research Institute
**List II: (Location)**
1. Karnal
2. Bikaner
3. Hisar
4. Jodhpur
Which of the following represents the correct combination?
(A) P-2, Q-3, R-4, S-1
(B) P-4, Q-1, R-2, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-3, Q-2, R-1, S-4

**99.** Khejri (Prosopis cineraria) is deeply revered and protected by which specific community in Rajasthan, historically known for their environmental conservation efforts?
(A) Bhil community
(B) Bishnoi community
(C) Meena community
(D) Garasiya community

**100.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The cultivation of exotic and high-yielding varieties of crops often leads to the loss of indigenous plant germplasm.
**Reason (R):** Farmers abandon traditional, locally adapted landraces in favor of uniform, high-yielding commercial varieties to maximize short-term profits.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**101.** Which of the following statements is true regarding the role of colostrum in domestic animal husbandry?
(A) Residual waste secretion produced prior to dry period onset that must be discarded.
(B) First post-parturition milk rich in protective antibodies essential for calf immunity.
(C) Thermally processed commercial dairy milk formulated specifically for extended shelf stability.
(D) Synthetic milk replacement formula derived exclusively from concentrated soybean protein isolates.

**102.** Identify the correct pair regarding the type of silk and its major producing state in India.
(A) Muga silk - Assam
(B) Mulberry silk - Rajasthan
(C) Eri silk - Punjab
(D) Tassar silk - Kerala

**103.** 'Pashmina' is a highly prized fine wool known globally for its warmth and softness. From which animal is authentic Pashmina wool harvested?
(A) Coarse outer fleece harvested from specialized high-altitude sheep breeds.
(B) Fine undercoat hair of high-altitude Changthangi goats.
(C) Soft ventral guard hair shorn from wild two-humped Bactrian camels.
(D) Fine fiber harvested from crossbred domestic rabbit and sheep hybrids.

NODIA

(ICAR)
(B) National Dairy Development Board (NDDB)
(C) Food Corporation of India (FCI)
(D) National Bank for Agriculture and Rural Development (NABARD)

**122.** Match the agricultural and biological products in List I with their sources in List II.

**List I: (Product)**
P. Saffron
Q. Coir
R. Shellac
S. Silk

**List II: (Source)**
1. Insect secretion
2. Coconut mesocarp
3. Insect cocoon
4. Flower stigma

Which of the following represents the correct combination?
(A) P-4, Q-2, R-1, S-3
(B) P-4, Q-1, R-2, S-3
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-2, R-1, S-4

**123.** The 'King of Cereals' is a title often attributed to Wheat due to its global prominence. Which specific species of wheat accounts for the vast majority (about 95%) of the wheat consumed globally, specifically used for making bread?
(A) Triticum durum
(B) Triticum dicoccum
(C) Triticum aestivum
(D) Triticum monococcum

**124.** Essential oils find wide application in aromatherapy, perfumery, and medicine. Which of the following aromatic grasses is commercially cultivated to extract an essential oil heavily used in mosquito repellents?
(A) Vetiveria zizanioides (Khus)
(B) Cymbopogon nardus (Citronella)
(C) Saccharum officinarum (Sugarcane)
(D) Cynodon dactylon (Doob grass)

**125.** The medicinal plant 'Rauvolfia serpentina' (Sarpagandha) is economically significant in the pharmaceutical industry. What is the primary medical application of the alkaloid 'Reserpine' extracted from its roots?
(A) Rapid clinical resolution of acute viral liver infections and chronic hepatitis.
(B) Managing severe hypertension and controlling selected psychiatric conditions.
(C) Neutralizing hemotoxic and neurotoxic snake venoms upon direct administration.
(D) Serving as a broad-spectrum antibacterial agent against systemic bacterial infections.

**126.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

**Assertion (A):** The cultivation of leguminous crops reduces the dependency of farmers on synthetic nitrogenous fertilizers.

**Reason (R):** Leguminous crops undergo a symbiotic relationship with Rhizobium bacteria, which convert atmospheric nitrogen into forms usable by the plant.

Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**127.** Which of the following is NOT a recognized objective of the National Medicinal Plants Board (NMPB)?
(A) Encouraging the cultivation of medicinal plants through financial incentives to farmers
(B) Promoting in-situ and ex-situ conservation of rare medicinal plants
(C) Exercising monopoly control over the retail pricing of all Ayurvedic medicines in India
(D) Supporting research and development in the medicinal plant sector

**128.** In apiculture, what triggers the complex behavioral phenomenon known as 'Swarming'?
(A) A sudden outbreak of bacterial disease within the hive
(B) The overcrowding of the colony, leading the old queen and a large group of workers to leave and establish a new colony
(C) An extreme drop in winter temperatures causing the bees to seek underground shelter
(D) The total depletion of honey reserves, causing the bees to attack neighboring hives

**129.** Honey bees exhibit a highly sophisticated communication system to indicate the distance and direction of a food source. Which scientist famously decoded the "Waggle Dance" of the honey bee?
(A) Charles Darwin
(B) Gregor Mendel

Click Here to Buy book on Flipkart

species of wild animals, animal articles, and trophies.

**113.** The economic potential of 'Agrosilvopasture' is significant in rural contexts. What does an Agrosilvopastoral system integrate?
(A) Only trees and agricultural crops
(B) Only trees and livestock grazing
(C) Trees, agricultural crops, and livestock/ pasture simultaneously
(D) Trees and aquaculture

**114.** Why is organic farming currently gaining immense economic traction and premium pricing in global agricultural markets?
(A) Organic crop varieties mature twice as fast as non-organic commercial cultivars.
(B) Growing consumer demand for pesticide-free food produces strong price premiums.
(C) Organic farm management eliminates manual labor requirements through natural biological processes.
(D) Organic produce possesses natural preservative compounds that guarantee multi-year storage life.

**115.** What is the fundamental mechanism by which the biofertilizer 'Azotobacter' enhances soil fertility?
(A) It infects legume root hairs directly to form nitrogen-fixing symbiotic nodules.
(B) It secretes organic acids to dissolve insoluble rock phosphate into soil solution.
(C) It fixes free atmospheric nitrogen into ammonia as an unattached soil organism.
(D) It synthesizes broad-spectrum antibiotics that eliminate all competing soil bacteria.

**116.** Consider the following types of legally protected wildlife areas in India:
I. National Park
II. Wildlife Sanctuary
III. Biosphere Reserve
IV. Conservation Reserve
Which of the following statements regarding these areas is correct?
(A) Human activities like grazing and firewood collection are completely prohibited in all of them.
(B) A National Park has a higher degree of legal protection and stricter restrictions on human activity than a Wildlife Sanctuary.
(C) Biosphere Reserves are solely meant to protect a single flagship animal species.
(D) Conservation Reserves are privately owned lands with no government oversight.

**117.** Ecotourism heavily relies on the "Flagship Species" concept. What does this term mean in conservation economics?
(A) An animal species targeted to supply high volumes of bushmeat to local indigenous tribes.
(B) A high-profile species used to raise public support, funds, and habitat conservation.
(C) A bioindicator plant species with distinctive leaf morphology signifying high soil fertility.
(D) An aggressive non-native species that displaces indigenous flora while drawing scientific research.

**118.** Which state in India is consistently the leading producer of raw Lac, accounting for over 50% of the country's total production?
(A) Jharkhand
(B) Rajasthan
(C) Kerala
(D) Himachal Pradesh

**119.** In the context of economic botany, the term 'Cereals' originates from 'Ceres', the Roman goddess of agriculture. Cereals are essentially the cultivated grasses grown for their edible starchy grains. Botanically, the grain of a cereal is a special type of fruit known as a:
(A) Berry
(B) Drupe
(C) Caryopsis
(D) Legume

**120.** 'Alkaloids' are a massive class of naturally occurring organic compounds containing basic nitrogen atoms, many of which have profound physiological effects on humans. Which of the following is an alkaloid obtained from a plant and used as a powerful analgesic (painkiller) in medicine?
(A) Morphine (from Papaver somniferum)
(B) Menthol (from Mentha arvensis)
(C) Citronellal (from Cymbopogon nardus)
(D) Tannin (from Camellia sinensis)

**121.** The 'White Revolution' or Operation Flood propelled India to become the world's largest milk producer. Which organization was the primary driving force behind the success of Operation Flood?
(A) Indian Council of Agricultural Research

Downloaded from www.pdf.tube

milk yield with high butterfat content, forming the cornerstone of commercial dairy production and processing industries nationwide.

**28.** (A) Goat - Chevon
Domestic animals yield distinct commercial meat products designated by specific culinary terms. Goat meat is officially termed chevon, while mutton refers exclusively to meat obtained from mature sheep. Pork is derived from pigs, beef from cattle, and poultry encompasses meat from domesticated birds. Accurate terminology ensures proper standardization across livestock trading, meat processing, and consumer retail sectors.

**29.** (B) I and III only
The Rathi cattle breed is an indigenous dairy breed valued for high milk yields in arid Rajasthan. Goats are designated as the poor man's cow because they adapt to sparse vegetation while producing both milk and meat efficiently. Sheep rearing in Rajasthan contributes heavily to both carpet wool production and meat supply, making statements I and III correct.

**30.** (D) Bombyx mori
Bombyx mori, commonly known as the mulberry silkworm, is a completely domesticated lepidopteran insect responsible for over ninety percent of global commercial silk production. It produces cultivated white silk characterized by fine texture, high tensile strength, and uniform luster. Other silkworm species like Antheraea mylitta and Antheraea assamensis produce wild or vanya silks like tasar and muga.

**31.** (A) Morus alba
The mulberry silkworm, Bombyx mori, is a monophagous insect species, meaning its larvae feed exclusively on a single plant type to complete development. The sole natural host plant for this commercial silkworm is Morus alba, commonly known as the white mulberry tree. The tender foliage provides essential proteins, water, and nutrients required for optimal larval growth and silk production.

**32.** (B) Stifling
Stifling is a vital processing step in sericulture where pupae inside intact silk cocoons are killed using steam, hot air, or solar heat prior to adult emergence. If left alive, emerging moths bore holes through the cocoon wall, severing continuous filament threads into short pieces. Stifling preserves long intact silk fibers suitable for commercial reeling and spinning.

**33.** (B) Egg → Larva (Caterpillar) → Pupa → Adult Moth
The silkworm exhibits complete metamorphosis, passing through four distinct developmental stages during its biological lifecycle. The cycle begins when adult moths lay eggs, which hatch into feeding larvae or caterpillars. After undergoing multiple moults, larvae spin silk cocoons and transform into immobile pupae. Following metamorphosis inside the cocoon, fully formed adult moths emerge to complete reproduction.

**34.** (C) Apis mellifera (European bee)
Apis mellifera, commonly called the European or Western honey bee, is extensively cultivated in commercial apiculture across India. It is favored over indigenous wild species due to its gentle temperament, low swarming tendency, strong disease resistance, and significantly higher annual honey yield per hive. Its adaptability to movable-frame modern beehives makes it ideal for large-scale commercial honey and wax production.

**35.** (C) High sugar content creating high osmotic pressure along with low acidic pH.
Natural honey possesses long-term resistance to microbial spoilage due to its unique chemical composition. Foraging worker bees evaporate floral nectar to concentrate sugars above eighty percent, creating high osmotic pressure that dehydrates bacterial cells. Furthermore, bee enzymes convert glucose into gluconic acid, lowering pH levels to an acidic range between 3.2 and 4.5, which naturally suppresses microbial proliferation.

**36.** (D) To gather nectar and pollen, build wax combs, and tend developing larvae.
Worker bees are sterile female individuals that execute essential functional duties required for colony survival and commercial apiculture productivity. They forage for floral nectar and pollen, synthesize beeswax from abdominal glands to construct hexagonal comb structures, feed and tend developing larvae, clean and defend the hive, regulate nest temperature, and evaporate nectar to produce mature honey.

NODIA

(C) Karl von Frisch
(D) Louis Pasteur

**130.** State symbols often reflect local economic and ecological importance. Which of the following pairs represents the State Tree and State Animal (Livestock category) of Rajasthan, respectively?
(A) Teak and Blackbuck
(B) Khejri and Camel
(C) Rohida and Chinkara
(D) Neem and Sheep

**131.** Which of the following is an example of an economically significant 'Gum' yielding plant, primarily distinguished from 'Resins' by being soluble in water?
(A) Pinus roxburghii (Pine)
(B) Acacia senegal (Kummat)
(C) Hevea brasiliensis (Rubber)
(D) Cannabis sativa (Hemp)

**132.** Consider the following statements regarding the economic importance of biotechnology in agriculture:
I. Tissue culture is heavily utilized for the mass multiplication of elite banana and orchid varieties.
II. Genetically modified (GM) crops are currently cultivated without any regulatory oversight or approval process in India.
III. Bio-pesticides are generally more target-specific and environmentally friendly compared to broad-spectrum chemical pesticides.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**133.** The 'Flavr Savr' tomato was one of the earliest examples of genetically modified foods. What specific agronomic trait was engineered into the Flavr Savr tomato?
(A) Resistance to frost damage
(B) Delayed ripening and increased shelf life
(C) The ability to produce natural insect repellents
(D) Enhanced size up to five times a normal tomato

**134.** Identify the odd one out among the following based on their classification as major food grains versus cash crops.
(A) Rice
(B) Wheat
(C) Sugarcane
(D) Maize

**135.** What is the primary role of the queen bee in a commercial apiculture colony?
(A) Defending the hive against predatory wasps
(B) Foraging for nectar during the peak floral season
(C) Synthesizing beeswax to build the hexagonal comb cells
(D) Laying thousands of eggs daily to maintain or expand the colony population

**136.** The 'Blue Revolution' in India was a significant economic movement targeting the rapid expansion and modernization of which sector?
(A) Dairy farming
(B) Poultry production
(C) Fisheries and aquaculture
(D) Medicinal plant cultivation

**137.** Which of the following best describes the ecological and economic utility of the 'Khejri' (Prosopis cineraria) tree, often earning it the title "Kalpavriksha of the Thar Desert"?
(A) It demands intensive canal irrigation, restricting its viable range strictly to Indira Gandhi Canal zones.
(B) It yields highly prized structural hardwood processed primarily for high-end international furniture markets.
(C) It endures severe drought while supplying edible pods, livestock fodder, and fuelwood in arid zones.
(D) It exudes bio-toxic defensive sap that exterminates swarming desert locust populations on direct exposure.

**138.** Consider the following statements regarding major industrial and commercial crops:
I. Sugarcane is a perennial grass cultivated primarily for its sucrose content.
II. Cotton is an annual shrub whose fibers are entirely composed of cellulose.
III. Tea and Coffee are classified as beverage crops that yield valuable alkaloids (Caffeine).
IV. Jute is a synthetic fiber manufactured in chemical plants.
Which of the above statements is/are correct?
(A) I, II, and III
(B) II, III, and IV
(C) I, III, and IV

Click Here to Buy book on Amazon

(D) I, II, and IV

**139.** In the context of the wool industry, 'Carpet Wool' is generally rougher and thicker than 'Apparel Wool'. Which of the following states is the largest producer of carpet-grade wool in India?
(A) Jammu & Kashmir
(B) Rajasthan
(C) Himachal Pradesh
(D) Uttarakhand

**140.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The adoption of agroforestry models significantly increases the overall economic resilience of smallholder farmers.
**Reason (R):** Agroforestry diversifies farm output, providing multiple income streams (timber, fruits, fodder, crops) and buffering against the failure of a single crop due to climate anomalies.
Select the correct option:
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

www.nodia.in

NODIA

# ANSWERS

**1.** (B) A plant cultivated primarily to yield raw materials for manufacturing processes
Industrial plants are defined by their economic utility in providing raw materials for manufacturing, processing, and industrial applications rather than direct dietary consumption. Common examples include cotton for textiles, rubber trees for latex production, and timber species for construction. These plants form a critical backbone for agro-based industries, contributing significantly to global manufacturing supply chains.

**2.** (C) Sorghum bicolor (Jowar) when harvested specifically before grain maturity for cattle
Forage or fodder crops are specifically cultivated to feed livestock such as cattle, goats, and sheep. While crops like wheat, rice, and chickpeas are primarily harvested at full maturity for human consumption, Sorghum bicolor can be harvested prior to grain maturation to produce nutrient-rich green fodder, supporting livestock productivity and sustaining animal husbandry systems in agrarian economies.

**3.** (D) Medicinal plants are valued for pharmacologically active compounds, while industrial plants provide bulk raw materials like latex, fibers, or timber.
Medicinal plants are defined by the synthesis of bioactive secondary metabolites, such as alkaloids and flavonoids, which exert specific physiological effects for healthcare and pharmaceutical applications. Conversely, industrial crops are grown to yield large-scale bulk materials including plant fibers, natural rubber latex, structural timber, and resins utilized directly across various manufacturing and commercial processing operations.

**4.** (C) Poaceae
Cereals belong to the biological family Poaceae, commonly referred to as the grass family. This botanical family encompasses essential agricultural food staples including wheat, rice, maize, barley, oats, and millets. Members of Poaceae produce edible single-seeded fruits called caryopses, which contain nutrient-dense endosperm rich in carbohydrates, serving as the foundational energy source for human populations globally.

**5.** (B) They harbor symbiotic Rhizobium bacteria in root nodules to fix nitrogen.
Leguminous plants play a crucial ecological role in agricultural rotation systems due to their symbiotic association with nitrogen-fixing Rhizobium bacteria contained within specialized root nodules. These bacteria convert unreactive atmospheric nitrogen gas into bioavailable forms like ammonia, which enriches soil fertility, reduces the requirement for synthetic nitrogenous fertilizers, and enhances overall soil sustainability across successive crop seasons.

**6.** (D) Castor oil is widely used as a direct cooking oil in standard Indian households.
Castor oil is non-edible and toxic due to ricin compounds, preventing its use as a culinary oil in households. Instead, castor oil serves critical industrial functions as a high-viscosity lubricant, hydraulic fluid, and raw material in cosmetics or pharmaceuticals. Major edible oilseeds include mustard, groundnut, and soybean, which undergo refining specifically for culinary consumption.

**7.** (C) I and III only
Rice is a moisture-intensive crop requiring elevated temperatures and standing water during early development, making it well-suited for humid zones. Bajra is a drought-tolerant millet adapted to arid regions like Rajasthan. Wheat is classified as a rabi crop requiring cool growing weather and dry conditions during ripening, rather than heavy rainfall or kharif season cultivation.

**8.** (A) Azadirachta indica (Neem)
Azadirachtin is a potent limonoid secondary metabolite extracted primarily from the seeds and leaves of Azadirachta indica, commonly known as neem. It functions as an effective natural antifeedant, disruptor of insect growth, and eco-friendly biopesticide. Beyond agricultural pest management, neem extracts exhibit broad antimicrobial and therapeutic properties extensively utilized across traditional medicine and personal care products.

Downloaded from www.pdf.tube

**9.** (C) Roots
Ashwagandha, botanically known as Withania somnifera, is a highly valued medicinal plant in traditional Ayurvedic systems. The roots are the primary plant part harvested because they contain maximum concentrations of active therapeutic compounds called withanolides. These bioactive steroidal lactones exhibit potent adaptogenic, anti-inflammatory, neuroprotective, and immunomodulatory properties, providing significant health benefits in herbal pharmaceuticals.

**10.** (A) P-2, Q-1, R-4, S-3
Tulsi leaves yield essential oils rich in eugenol, which offers antimicrobial benefits. Cinchona bark yields quinine, an effective antimalarial alkaloid. Ashwagandha roots contain bioactive withanolides that function as stress-relieving adaptogens. Turmeric rhizomes contain curcumin, a powerful polyphenol recognized for its anti-inflammatory and antioxidant properties in pharmaceutical applications.

**11.** (D) Immunomodulatory and expectorant properties
Tulsi, or Ocimum sanctum, is renowned in traditional pharmacopeias for its rich concentration of bioactive phytochemicals, particularly eugenol and ursolic acid. These chemical constituents confer potent immunomodulatory and expectorant actions, making Tulsi extracts effective in enhancing immune responses, clearing respiratory mucus, alleviating bronchial congestion, and relieving common coughs, colds, and respiratory disorders.

**12.** (B) Epidermal hairs of the seed coat
Cotton fibers are commercially valuable natural textile raw materials obtained from plants belonging to the genus Gossypium. Botanically, these fibers represent single-celled epidermal trichomes, or seed coat hairs, that elongate significantly from the outer surface of developing seeds. Unlike bast or leaf fibers, cotton consists almost entirely of pure cellulose, providing high softness and absorbency.

**13.** (D) Retting
Retting is a vital biological processing step in natural fiber production, particularly for jute and flax. Harvested plant stems are submerged in slow-flowing water where aquatic microorganisms, mainly bacteria and fungi, break down pectin, mucilage, and cellular tissues binding the fiber bundles. This microbial degradation loosens the bast fibers from the woody core, enabling clean extraction.

**14.** (A) Jute - Bast fiber
Plant fibers are categorized by their anatomical origin within the plant structure. Jute is classified as a bast fiber because it is extracted from the phloem or inner bark tissue of the stem. Flax also yields bast fiber, whereas cotton represents epidermal seed hairs and coconut provides coir fiber harvested from the fibrous mesocarp of the fruit.

**15.** (B) I, III, and IV
Cotton requires approximately 210 frost-free days and warm weather to mature successfully. Flax stems produce high-grade bast fibers used to manufacture fine linen fabric, while coir is obtained from coconut mesocarp. Jute demands humid conditions, high temperatures, and abundant rainfall, making it suited to alluvial river deltas like West Bengal rather than arid Rajasthan deserts.

**16.** (D) Vulcanization
Vulcanization is a chemical treatment process where raw rubber harvested from Hevea brasiliensis is cross-linked using sulfur under heated conditions. Unprocessed latex rubber is naturally soft, sticky when warm, and brittle when cold. Adding sulfur forms disulfide bonds between polymer chains, greatly enhancing structural elasticity, tensile strength, thermal stability, and mechanical durability required for industrial applications.

**17.** (C) Pinus roxburghii (Chir Pine)
Pinus roxburghii, commonly known as Chir Pine, is a major commercial source of natural oleoresin in India. Resins are complex plant exudates extracted by tapping the trunk bark. The harvested resin undergoes fractional distillation to yield essential turpentine oil and solid rosin, which are critical raw materials in manufacturing varnishes, adhesives, soaps, and sealing compounds.

**18.** (A) Eucalyptus globulus (Eucalyptus)
Eucalyptus globulus is cultivated specifically for the extraction of its volatile essential oil, rich in 1,8-cineole (eucalyptol), which readily evaporates at ambient temperatures and yields a

NODIA

distinct aroma. In contrast, crops like sunflower, mustard, and groundnut are cultivated to extract fixed or fatty edible vegetable oils, which do not evaporate and serve primarily as culinary fats.

**19.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Unprocessed natural rubber consists of soft cis-1,4-polyisoprene polymer chains lacking structural stability. This raw material exhibits extreme temperature sensitivity, soft sticky properties under heat, and brittle behavior in cold environments, rendering it unsuitable for manufacturing durable automobile tires. Sulfur vulcanization cross-links these polymer chains, providing the necessary elasticity, heat resistance, and mechanical strength for industrial applications.

**20.** (D) Teak logs
Non-Timber Forest Products comprise biological goods harvested from forests excluding commercial industrial timber. Products like Tendu leaves, Sal seeds, Mahua flowers, resins, gums, and medicinal herbs are categorized as non-timber resources because their collection does not require felling whole trees. Teak logs represent structural timber obtained from felled trees, excluding them from the Non-Timber Forest Product classification.

**21.** (B) Wrapping material for bidi manufacturing
Tendu leaves, harvested from Diospyros melanoxylon trees, possess commercial value across central and western India, including southern Rajasthan. The leaves are smooth, pliable, durable, and resistant to decay when dried, making them uniquely suitable as natural wrappers for hand-rolled bidis. The collection of tendu leaves provides crucial seasonal employment and economic revenue for tribal communities.

**22.** (A) Bark blazing/incision → Exudation of sap → Drying and hardening → Harvesting
Natural gum extraction follows a structured sequential procedure to ensure quality yield. Tappers first make controlled cuts or blazes in the outer trunk bark to expose internal sap tissues. The tree exude liquid sap as a protective response, which gradually dries and hardens into solid gum nodules upon atmospheric exposure. Finally, these hardened gum tears are manually harvested.

**23.** (D) Grass
Under the Indian Forest Act amendment of 2017, bamboo grown outside designated forest areas was legally reclassified from a tree to a grass. Botanically a member of the Poaceae family, this statutory change exempted non-forest bamboo from rigid felling and transit permit requirements, empowering rural farmers to cultivate, harvest, and trade bamboo freely as an agricultural resource.

**24.** (B) Breeds whose males are well suited for agricultural draft work and transport.
Livestock breeds are categorized according to their primary economic function. Draught cattle breeds are selectively bred for physical strength, endurance, and robust skeletal structures, making the males ideal for heavy agricultural operations, plowing, carting, and load transport. Females of pure draught breeds typically yield minimal surplus milk, distinguishing them from specialized dairy or dual-purpose cattle breeds.

**25.** (D) Nagauri
The Nagauri breed is a famous indigenous cattle breed originating from the Nagaur district of Rajasthan. Recognized nationwide as an exceptional draught breed, Nagauri bullocks are muscular, agile, swift, and possess great physical endurance. They are extensively utilized for heavy agricultural draft work, deep plowing in dry soils, and pulling heavy transport carts across arid landscapes.

**26.** (A) Domesticated birds like chickens, ducks, and turkeys raised for meat or eggs.
Poultry encompasses a wide range of domesticated avian species kept under agricultural management for economic productivity. This includes chickens, ducks, turkeys, geese, and quails raised primarily to produce eggs, meat, or feathers. While commercial chickens dominate global production, the economic classification legally covers all managed domesticated bird species contributing to food supply chains and animal husbandry sectors.

**27.** (D) Buffalo; high milk yield
The Murrah is a world-renowned water buffalo breed originating from northwestern India. Characterized by tightly curled horns and deep jet-black body coloration, Murrah buffaloes represent the premier dairy breed in the country. They are economically valued for their exceptional

Click Here to Buy book on Flipkart

**104.** Consider the following statements regarding the poultry industry:
I. A standard chicken egg contains approximately 6 grams of high-quality protein.
II. The white portion of the egg (albumen) consists almost entirely of fat and cholesterol.
III. India ranks among the top three egg-producing nations globally.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**105.** Fish farming provides a crucial source of human nutrition. What specific class of nutrients, highly beneficial for human cardiovascular health and brain development, is fish uniquely rich in compared to terrestrial meat sources?
(A) High concentrations of long-chain saturated fatty acids
(B) Complex plant-derived structural carbohydrates
(C) Essential omega-3 polyunsaturated fatty acids
(D) Water-soluble ascorbic acid and complex vitamin C

**106.** In India, three species of fast-growing fish are classically categorized as "Indian Major Carps" and form the backbone of freshwater aquaculture. Which of the following is NOT one of the Indian Major Carps?
(A) Labeo rohita (Rohu)
(B) Catla catla (Catla)
(C) Cirrhinus mrigala (Mrigal)
(D) Cyprinus carpio (Common Carp)

**107.** The concept of "Somatic Hybridization" in biotechnology involves the fusion of protoplasts from two different plant species. What is the primary prerequisite for this cellular fusion to occur?
(A) Enzymatic removal of the rigid outer cell wall using cellulase and pectinase.
(B) Strict genetic identity between donor plants belonging to the exact same botanical variety.
(C) Thorough osmotic dehydration of intact target plant cells prior to initiating membrane fusion.
(D) Surgical extraction and immediate disposal of nuclear material from both participating cells.

**108.** Arrange the logical sequence of operations in a commercial dairy processing plant for liquid milk production.
(A) Pasteurization → Standardization → Homogenization → Packaging
(B) Standardization → Pasteurization → Homogenization → Packaging
(C) Homogenization → Packaging → Standardization → Pasteurization
(D) Standardization → Homogenization → Pasteurization → Packaging

**109.** Which of the following animal diseases is correctly identified as a zoonotic disease (transmissible from animals to humans), posing an occupational hazard to dairy and abattoir workers?
(A) Foot and Mouth Disease (FMD)
(B) Brucellosis
(C) Rinderpest
(D) Black Quarter

**110.** Arrange the following plant products based on the general complexity of their historical processing from raw material to finished industrial product (from least complex to most complex).
1. Firewood (Timber)
2. Cotton fabric
3. Vulcanized rubber tire
(A) 1, 2, 3
(B) 1, 3, 2
(C) 2, 1, 3
(D) 3, 2, 1

**111.** Which medicinal plant is widely recognized in Ayurveda for improving memory and cognitive function, earning the common name "Brain tonic"?
(A) Bacopa monnieri (Brahmi)
(B) Ricinus communis (Castor)
(C) Calotropis procera (Aak)
(D) Cassia fistula (Amaltas)

**112.** Identify the incorrect statement regarding the Wildlife Protection Act, 1972, and its economic implications.
(A) It strictly prohibits the hunting of all wild animals listed in Schedule I.
(B) It permits the unhindered commercial trade of ivory within Indian borders.
(C) It governs the establishment of protected areas like National Parks and Sanctuaries.
(D) It regulates the trade and commerce in some

NODIA

**37.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Apiculture yields significant indirect economic advantages for crop production beyond direct harvests of honey and beeswax. As worker bees forage across agricultural fields for nectar, they act as highly efficient biological cross-pollinators. This transfer of pollen grains improves fertilization efficiency, enhances seed set, and substantially increases overall crop yields across horticultural, oilseed, and pulse farming systems.

**38.** (B) Pisciculture focuses on finfish, while aquaculture includes all aquatic species like shellfish and water plants.
Pisciculture is a specialized branch of agriculture restricted specifically to the breeding, rearing, and harvesting of finfish under managed water conditions. Aquaculture is a broader encompassing term that includes the controlled culture of all commercially useful aquatic organisms, including finfish, crustaceans like prawns, mollusks such as oysters, edible seaweeds, and aquatic plants across freshwater, brackish, and marine habitats.

**39.** (A) Farming complementary fish species occupying different feeding zones in one pond to optimize yield.
Composite fish culture, or polyculture, maximizes fish productivity by stocking multiple compatible species with non-competing feeding habits in a single pond. For instance, surface feeders like Catla, column feeders like Rohu, and bottom feeders like Mrigal inhabit distinct water layers. This spatial and dietary differentiation ensures complete utilization of available natural food resources without intra-pond species competition.

**40.** (A) P-2, Q-4, R-1, S-3
Capture fisheries involve collecting fish naturally available in open wild water bodies. Inland fisheries operate within freshwater systems including rivers, lakes, reservoirs, and agricultural ponds. Marine fisheries concentrate on harvesting marine organisms in coastal waters and oceans, whereas culture fisheries entail artificial propagation and controlled rearing of aquatic species in managed, confined water bodies to optimize commercial production.

NODIA

**41.** (D) Pituitary gland
Induced breeding in commercial pisciculture utilizes hypophysation, a process involving intramuscular or intraperitoneal injections of pituitary gland extract prepared from donor fish. This pituitary extract contains gonadotropic hormones that stimulate maturation of fish gonads and induce synchronized spawning under controlled hatchery environments, ensuring steady production of pure, high-quality fish seed for aquaculture stocking.

**42.** (B) It is secreted by special glands of the female lac insect (Kerria lacca) as a protective covering.
Commercial lac is a natural resinous secretion produced by specialized dermal glands of the female lac insect, Kerria lacca. These minute parasitic insects settle in dense colonies on tender shoots of specific host trees, secreting resinous layers that coalesce into a protective hard encrustation around their bodies. This encrustation is scraped off twigs to yield raw lac.

**43.** (D) Mangifera indica (Mango)
Lac insects depend on specific host trees that provide succulent twigs rich in plant sap necessary for insect nourishment and resin synthesis. Major recognized host trees in India include Butea monosperma (Palash), Ziziphus mauritiana (Ber), and Schleichera oleosa (Kusum). Mangifera indica (Mango) lacks suitable sap characteristics and bark structure, making it unsuitable for commercial lac cultivation.

**44.** (C) I, II, and III
Scraping raw lac encrustations from host tree branches yields sticklac. Crushing and washing sticklac removes insect debris, dye, and extraneous matter, transforming it into seedlac. Heating, melting, filtering, and stretching seedlac produces commercial shellac. India is a primary global exporter rather than an importer of lac products, making statements I, II, and III correct.

**45.** (A) Broilers
In commercial poultry management, birds are specialized based on economic production goals. Broilers are fast-growing chicken breeds selected and reared specifically for high-efficiency meat yield within a brief five to seven-week grow-out cycle. Conversely, layers are specialized chicken strains maintained over extended laying periods

colostrum contains dense concentrations of immunoglobulins, particularly IgG antibodies, along with essential vitamins, proteins, and minerals. Feeding colostrum to newborn calves within early hours provides passive mucosal immunity, protecting vulnerable calves against neonatal pathogens before their active immune system matures.

**102.** (A) Muga silk - Assam
Muga silk is a geographical indication product originating from Assam, produced by the wild silkworm Antheraea assamensis feeding on Som and Soalu leaves. Muga silk is famous for its natural golden-yellow luster, high durability, and stain resistance. Other silk varieties like Mulberry, Tasar, and Eri are predominantly produced across Karnataka, Jharkhand, and northeastern regions.

**103.** (B) Fine undercoat hair of high-altitude Changthangi goats.
Authentic Pashmina wool is derived from the ultra-fine undercoat fiber shed seasonally by Changthangi cashmerian goats reared at high altitudes in Ladakh. To withstand severe freezing temperatures, these domestic goats grow an exceptionally fine, soft, and light down hair beneath their outer fleece, which is manually combed out to weave luxury Pashmina shawls and garments.

**104.** (B) I and III only
A standard chicken egg contains approximately 6 grams of high-quality digestible protein containing all essential amino acids. India is one of the top global egg producers. The egg white, or albumen, consists primarily of water and proteins like ovalbumin, while fat and cholesterol are concentrated in the egg yolk, making statements I and III correct.

**105.** (C) Essential omega-3 polyunsaturated fatty acids
Fish meat provides high dietary value due to its abundance of essential omega-3 polyunsaturated fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These long-chain fatty acids are scarce in land animal meats and are crucial for human cardiovascular health, reducing systemic inflammation, supporting brain function, and maintaining optical metabolic health.

**106.** (D) Cyprinus carpio (Common Carp)
Indian Major Carps comprise three fast-growing indigenous freshwater species central to Indian polyculture: Labeo rohita (Rohu), Catla catla (Catla), and Cirrhinus mrigala (Mrigal). Cyprinus carpio, commonly known as the Common Carp, is an introduced exotic carp species rather than an indigenous Indian Major Carp, though widely cultured alongside them.

**107.** (A) Enzymatic removal of the rigid outer cell wall using cellulase and pectinase.
Somatic hybridization allows fusing protoplasts from sexually incompatible plant species to generate novel genetic hybrids. The essential preliminary step requires complete enzymatic degradation of rigid cellulosic cell walls using cellulase and pectinase enzymes. Removing the cell wall releases naked, membrane-bound protoplasts, enabling induced plasma membrane fusion via polyethylene glycol or electrofusion techniques.

**108.** (B) Standardization → Pasteurization → Homogenization → Packaging
Dairy liquid milk processing follows a precise functional sequence. Raw milk is first standardized to adjust butterfat and solids-not-fat ratios. Standardized milk undergoes thermal pasteurization to eliminate pathogenic bacteria, followed by mechanical homogenization under pressure to break fat globules into uniform sizes, preventing creaming, before automated cold packaging for retail delivery.

**109.** (B) Brucellosis
Brucellosis, caused by Brucella bacteria species, is a prominent bacterial zoonotic disease affecting cattle, sheep, and goats. The infection transmits readily to dairy workers, veterinarians, and abattoir personnel through contact with infected animal fluids or unpasteurized milk. In humans, it manifests as undulant fever, joint pain, and chronic fatigue, representing an occupational health hazard.

**110.** (A) 1, 2, 3
Processing raw timber into firewood involves minimal physical cutting without chemical transformation. Converting raw cotton bolls into woven textiles requires ginning, carding, spinning, and weaving operations. Manufacturing vulcanized rubber tires involves complex industrial operations, including latex

Downloaded from www.pdf.tube

horizontally to develop mature groundnut pods protected beneath the soil surface.

**55.** (A) Steam distillation
Steam distillation is the standard industrial extraction method for obtaining volatile essential oils from aromatic crops such as lemongrass, mint, and citronella. Passing pressurized steam through crushed plant material vaporizes delicate aromatic compounds without thermal degradation. The resulting steam and oil vapor mixture passes through a condenser, where hydrophobic essential oil separates cleanly from the condensed water layer.

**56.** (B) Dried flower bud
Clove, botanically classified as Syzygium aromaticum, is an aromatic spice belonging to the family Myrtaceae. The commercially traded spice consists of unopened, dried flower buds harvested just as petals turn light pink. Rich in essential volatile oils dominated by eugenol, dried cloves provide intense aromatic flavor, preservative properties, and medicinal benefits across culinary and pharmaceutical applications.

**57.** (B) Coriander, Cumin, Fenugreek
Rajasthan dominates Indian agricultural production of seed spices, benefiting from favorable arid and semi-arid rabi growing conditions. Major seed spices cultivated across western and eastern districts include coriander (Dhaniya), cumin (Jeera), and fenugreek (Methi). These crops require modest moisture during growth and clear dry weather during harvesting, yielding high commercial market value.

**58.** (C) Stigmas and styles
Saffron, one of the most valuable spices globally, is harvested from Crocus sativus, a perennial bulbous plant. The commercial spice consists exclusively of the dried three-pronged vivid red stigmas along with attached short yellow styles extending from each flower. Manual harvesting and processing of thousands of individual flower stigmas account for saffron's high market price.

**59.** (B) II and III only
Groundnut is a leguminous oilseed that fixes atmospheric nitrogen in soils through root nodule symbiosis. Soybean processing produces both vegetable oil and protein-dense soybean meal used for animal feed. Mustard is predominantly cultivated as a rabi (winter) crop in Rajasthan rather than a kharif crop, making statements II and III correct.

**60.** (A) Boiling → Drying → Polishing → Colouring
Commercial turmeric processing follows a standardized post-harvest sequence to ensure quality and appearance. Freshly dug raw rhizomes are first boiled in water to gelatinize starches and eliminate raw odors. The boiled rhizomes are sun-dried until hard and brittle, then mechanically polished to remove rough skin, and finally colored or dusted to enhance market presentation.

**61.** (A) Sangri
Khejri, or Prosopis cineraria, serves as an essential socio-economic tree in arid ecosystem management across Rajasthan. The green, slender immature seed pods harvested from Khejri trees are locally called Sangri. Sangri pods are highly nutritious, rich in dietary fiber and proteins, and are harvested, dried, and cooked to prepare traditional regional culinary delicacies like Panchkuta.

NODIA

**62.** (A) Acacia senegal (Kummat)
Acacia senegal, locally known as Kummat, is a drought-hardy tree native to the arid zones of Rajasthan. It serves as the primary natural source of true Gum Arabic, a water-soluble polysaccharide exudate obtained by tapping trunk bark. Gum Arabic is widely used as a stabilizer, emulsifier, and thickening agent in food manufacturing, cosmetics, and pharmaceuticals.

**63.** (B) Flaying → Curing → Pre-tanning → Tanning → Finishing
Leather manufacturing follows a structured sequential process. Animal skin is first removed from the carcass during flaying and cured with salt to prevent bacterial decay. Pre-tanning processes like liming and unhairing prepare hides for main tanning, where collagen fibers are chemically stabilized using chromium salts or vegetable tannins. Finally, mechanical finishing produces marketable leather goods.

**64.** (C) Resistance to bollworm insect pests
Bt Cotton was the first genetically modified crop commercially approved for cultivation in India. It incorporates cry genes derived from the soil bacterium Bacillus thuringiensis. These inserted genes express endotoxin proteins inside plant tissues, conferring targeted biological resistance

against destructive bollworm pests, particularly pink bollworm, thereby reducing synthetic chemical insecticide applications and increasing yields.

**65.** (A) Rapid mass production of disease-free, clone-like plantlets in a limited timeframe.
Plant tissue culture, or micropropagation, offers distinct commercial advantages over conventional vegetative propagation. Culturing explants on nutrient media under sterile laboratory conditions enables rapid, exponential mass cloning of genetically identical, disease-free plantlets from elite parent stock regardless of seasonal limits. This biotechnology is widely utilized for commercial production of bananas, orchids, and ornamental plants.

**66.** (C) Blue-Green Algae (Cyanobacteria)
Blue-Green Algae, or Cyanobacteria, are free-living and symbiotic photosynthetic microorganisms extensively utilized as biofertilizers in flooded paddy fields. Cyanobacteria establish a nitrogen-fixing symbiotic relationship with the floating aquatic water fern Azolla. This biological association fixes atmospheric nitrogen directly into paddy water, enriching soil nitrogen availability and significantly enhancing rice crop yields naturally.

**67.** (B) They improve root surface area to increase plant uptake of soil phosphorus and moisture.
Mycorrhizae are beneficial symbiotic associations formed between specialized soil fungi and plant roots. Fungal hyphae extend far beyond root zones, expanding the effective absorptive surface area of root systems. This structural network significantly enhances plant uptake of immobile soil nutrients, particularly phosphorus and micronutrients, while improving water absorption efficiency and drought resilience in crops.

**68.** (A) P-2, Q-4, R-3, S-1
Transgenic crops contain artificially inserted foreign genes from other species. Biofertilizers contain live microorganisms that enhance soil nutrient availability through nitrogen fixation or phosphate solubilization. Biopesticides utilize natural pathogens to control agricultural pests, and vermicompost represents organic manure produced through the digestive action of specialized earthworms on organic waste.

**69.** (B) Trichoderma viride
Trichoderma viride is a free-living soil fungus widely utilized in organic farming as a potent biological control agent against soil-borne fungal pathogens. It suppresses harmful fungi like Rhizoctonia, Pythium, and Fusarium through mycoparasitism, enzyme production, and nutrient competition. Applying Trichoderma as a seed or soil treatment protects crop root systems without chemical residues.

**70.** (A) I, II, and III
Rhizobium forms root nodules specifically in leguminous crops for nitrogen fixation, whereas Azotobacter is a free-living bacterium that fixes nitrogen for non-legumes like wheat. Vermicomposting relies on earthworms to break down organic wastes into rich manure. Synthetic chemical pesticides harm beneficial microflora, reducing biofertilizer efficacy, making statements I, II, and III correct.

**71.** (B) Coating the hides heavily with wet common salt (salting)
Curing is a critical initial preservation step in leather processing that prevents raw hide putrefaction caused by bacterial activity. Heavy salting, or wet salting, involves applying abundant common salt (sodium chloride) evenly over freshly flayed hides. The salt draws out internal moisture through osmosis, lowering water activity within skin tissues and inhibiting microbial growth during transit.

**72.** (C) Chokla
The Chokla sheep breed, native to the Shekhawati region encompassing Sikar, Jhunjhunu, and Churu districts of Rajasthan, is renowned as the "Indian Merino." Chokla sheep produce fine, high-quality fleece with light crimp and superior fiber length. This wool is ideal for manufacturing premium carpet yarn, warm blankets, and specialized apparel fabrics.

**73.** (D) Tharparkar
Tharparkar is an indigenous dual-purpose cattle breed originating from the Thar desert region, known for heat tolerance and milk production. Conversely, Magra, Pugal, and Nali represent distinct native sheep breeds found across Rajasthan, raised primarily for carpet wool production. Thus, Tharparkar is distinct as a bovine species rather than an ovine breed.

Click Here to Buy book on Amazon

**74.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Rural economies across western Rajasthan depend heavily on livestock rearing involving sheep and goats rather than water-intensive crop agriculture. Arid environments experience irregular rainfall, low soil organic matter, and frequent droughts, making crop farming unreliable. Small ruminants exhibit high physiological tolerance to heat and drought, sustaining live weight on coarse native vegetation where crops fail.

**75.** (C) The threshold of human presence and facilities an ecosystem can support without degradation.
In ecological economics and wildlife management, carrying capacity defines the maximum level of human access, infrastructure, and tourist activity a sanctuary can accommodate without inducing ecosystem degradation, wildlife disturbance, or habitat fragmentation. Establishing visitor carrying capacities prevents over-tourism, protects delicate ecological balances, and ensures long-term environmental sustainability in protected wilderness areas.

**76.** (B) Economic revenue and regional jobs created via eco-tourism and allied hospitality operations.
Maintaining healthy wildlife populations in national parks like Ranthambore generates direct economic benefits by driving regional ecotourism economies. Nature-based tourism creates substantial revenue streams and local employment across hospitality, safari transport, guiding services, handicraft sales, and municipal services. This economic inflow incentivizes biodiversity protection and provides sustainable rural livelihoods around protected reserves.

**77.** (B) Cultivating plant species in botanical gardens located outside their natural habitats.
Ex-situ conservation entails preserving, cultivating, and propagating endangered or economically valuable plant species outside their natural native habitats. Establishing specialized botanical gardens, germplasm banks, seed repositories, and tissue culture tissue banks fall under ex-situ conservation strategies promoted by the National Medicinal Plants Board to protect threatened medicinal flora from local extinction and habitat destruction.

**78.** (C) Arid Forest Research Institute (AFRI) - Jodhpur
The Arid Forest Research Institute is located at Jodhpur, conducting specialized scientific research on forestry techniques, eco-restoration, and desertification control in arid regions. Conversely, the Central Sheep and Wool Research Institute is based at Avikanagar, the Central Arid Zone Research Institute is at Jodhpur, and the National Research Centre on Camel operates in Bikaner.

**79.** (B) Jaisalmer
The Jaisalmeri camel breed originates from the desert terrain of Jaisalmer district in western Rajasthan. Highly regarded for its lean build, long slender limbs, and agility, this single-humped breed is famous nationwide as an exceptional riding and draft camel. Jaisalmeri camels are extensively utilized by border security forces and desert dwellers for swift transport.

NODIA

**80.** (A) I and II only
Camel milk is rich in Vitamin C, low in fat, and contains insulin-like proteins beneficial for managing diabetes. Camel hair is traditionally woven into carpets, ropes, and winter textiles across rural Rajasthan. Agricultural mechanization has actually caused camel populations to decline in recent decades, making statements I and II correct.

**81.** (A) Camelus dromedarius
The single-humped Arabian camel, predominant across the arid and semi-arid desert regions of Rajasthan, is botanically classified as Camelus dromedarius. This species is physiologically adapted to hyper-arid conditions, high heat, and prolonged water deprivation. In contrast, Camelus bactrianus represents the cold-adapted two-humped camel found in high-altitude central Asian deserts like Ladakh.

**82.** (B) Ecotourism promotes sustainable travel that conserves natural ecosystems and supports local community welfare.
Ecotourism is defined as responsible travel to natural environments that actively conserves biodiversity, maintains ecological integrity, and enhances the economic well-being of local communities. Unlike conventional mass tourism, which often leads to environmental degradation and resource depletion, ecotourism prioritizes environmental education, low-impact

primarily to maximize commercial egg output rather than meat production.

**46.** (B) Birds are kept on litter-covered floors where bedding mixes with droppings to yield valuable organic manure.
The Deep Litter System is an intensive poultry housing method where birds reside on indoor concrete floors covered with absorbent bedding materials like rice husks, wood shavings, or chopped straw. Avian droppings mix continuously with the litter, triggering aerobic decomposition. This system provides warmth, protects birds from harsh weather, minimizes disease transmission, and yields nutrient-rich organic poultry manure.

**47.** (B) It produces nutrient-dense black meat characterized by high protein and low fat and cholesterol.
Kadaknath is a distinct indigenous chicken breed originating from Madhya Pradesh and reared across Rajasthan. Known for fibromelanosis, a genetic trait causing dark pigmentation of skin, meat, bones, and internal organs, Kadaknath yields highly prized black meat. This meat is economically valued for high protein content, rich essential amino acids, low fat composition, and low cholesterol levels.

**48.** (D) Anthrax is the most common cause of mass mortality in commercial broiler chickens.
Anthrax is a severe bacterial disease caused by Bacillus anthracis that primarily infects mammalian livestock such as cattle, sheep, and goats, but rarely affects avian species. Common poultry diseases causing mortality include viral infections like Ranikhet (Newcastle disease) and Marek's disease, as well as protozoan intestinal infections like Coccidiosis, which disrupt poultry operations.

**49.** (B) Isabgol (Plantago ovata)
Isabgol, botanically designated as Plantago ovata, is an economically vital medicinal crop extensively cultivated in arid regions of Rajasthan and Gujarat. The seed husk contains rich soluble mucilaginous fiber that expands upon contact with water. Isabgol is exported globally as psyllium husk, functioning as a gentle natural laxative, dietary fiber supplement, and remedy for gastrointestinal disorders.

**50.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The cultivation of dryland medicinal crops like Safed Musli and Aloe Vera has expanded across Rajasthan due to favorable economic and climatic parameters. These species exhibit high water-use efficiency, thriving under arid and semi-arid conditions with low irrigation demands. Furthermore, expanding pharmaceutical market demand ensures higher financial returns per unit area compared to traditional cereal crops.

**51.** (C) Ministry of AYUSH
The National Medicinal Plants Board was established by the Government of India in 2000 to coordinate policy, conservation, resource mapping, and sustainable cultivation of medicinal plants. NMPB operates under the Ministry of AYUSH (Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homoeopathy), working to strengthen natural drug resource bases and integrate herbal medicine sectors.

**52.** (C) Rajasthan
Rajasthan is the primary producer of mustard in India, accounting for nearly forty percent of national seed production. Favorable agro-climatic conditions during the rabi season, including cool growth temperatures and well-drained light soils, support extensive mustard farming across northern and eastern districts. This crop plays a major role in meeting national edible oil requirements.

**53.** (B) 40% protein and 20% oil
Soybean, or Glycine max, occupies a unique position among agricultural commodities as both a major pulse and an oilseed. A mature soybean seed contains approximately forty percent high-quality plant protein and twenty percent vegetable oil by weight. This dual nutritional profile makes soybean an essential industrial raw material for processing edible oil and protein-rich animal feeds.

**54.** (C) Pegging
Groundnut exhibits a unique underground fruit development process termed pegging. Following successful surface self-pollination, the flower stalk or gynophore elongates downward, bending toward the ground. This growing structure, called the peg, penetrates two to five centimeters into the soil, where the fertilized ovary expands

Downloaded from www.pdf.tube

bioactive limonoids, predominantly azadirachtin, salannin, and nimbin. Formulated into botanical biopesticides, neem oil acts as a natural antifeedant, insect growth regulator, and repellent, widely utilized in organic farming to manage agricultural crop pests safely.

**92.** (B) I, II, and IV
Coir fiber is extracted from coconut fruit mesocarp and exhibits natural salt resistance. The Central Sheep and Wool Research Institute operates at Avikanagar, Rajasthan, while Gir cattle represent a premier indigenous milch breed. Pebrine is a devastating microsporidian fungal disease affecting silkworms rather than honey bees, making statements I, II, and IV correct.

**93.** (D) Eucalyptus oil - Edible cooking medium
Eucalyptus oil is an essential oil extracted from Eucalyptus leaves, rich in eucalyptol compound. It possesses strong aromatic and medicinal properties, used in decongestants, antiseptics, and pharmaceuticals, but is toxic if ingested as an edible cooking oil. Linseed, castor, and mint extracts are correctly paired with their primary industrial and pharmaceutical applications.

**94.** (B) The type of beta-casein protein present
Milk is classified into $A_1$ and $A_2$ categories based on genetic variations in the beta-casein protein chain at amino acid position 67. $A_1$ milk contains histidine at this position, yielding beta-casomorphin-7 upon digestion, whereas $A_2$ milk contains proline. Indigenous Zebu cattle breeds produce $A_2$ milk naturally, which is widely considered easier to digest than $A_1$ milk.

**95.** (B) Beta-carotene (Pro-vitamin A)
Golden Rice is a biofortified genetically engineered crop developed to combat Vitamin A deficiency in developing countries. Scientists inserted genes encoding phytoene synthase and carotene desaturase enzymes into rice genomes. This genetic pathway enables biosynthesizing beta-carotene, a precursor converted into Vitamin A inside human bodies, within the edible starchy endosperm of mature rice grains.

**96.** (B) They invariably deplete the soil of nitrogen, requiring heavy urea application.
Pulses, or leguminous crops, are unique because they fix atmospheric nitrogen through symbiotic Rhizobium root nodule bacteria, enriching soil nitrogen rather than depleting it. Consequently, pulses require minimal synthetic urea application, contrasting with cereal crops. They feature deep taproots, yield high dietary protein for human nutrition, and produce botanical legume fruit pods.

NODIA

**97.** (A) Pennisetum glaucum (Bajra)
Bajra, botanically named Pennisetum glaucum and commonly known as pearl millet, is a coarse food grain crop. Cultivated as a staple food across arid districts of Rajasthan, Bajra exhibits high heat and drought tolerance. It thrives in light sandy soils where major cereals fail, providing dietary carbohydrates, minerals, and fodder.

**98.** (A) P-2, Q-3, R-4, S-1
The National Research Centre on Camel operates at Bikaner, conducting research on camel health and production. The Central Institute for Research on Buffaloes is located at Hisar, the Central Arid Zone Research Institute operates from Jodhpur, and the National Dairy Research Institute is a premier dairy research facility situated at Karnal.

**99.** (B) Bishnoi community
The Khejri tree (Prosopis cineraria) is deeply revered and fiercely protected by the Bishnoi community of Rajasthan. Historically celebrated for their environmental conservation philosophy, the Bishnois consider Khejri trees sacred. This commitment was highlighted during the 1730 Khejarli massacre, where Amrita Devi and 363 Bishnois sacrificed their lives to prevent felling of Khejri groves.

**100.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Cultivating high-yielding exotic crop varieties accelerates the loss of indigenous plant genetic diversity. Farmers abandon traditional, locally adapted landraces in favor of uniform commercial seeds to achieve short-term yield gains. This displacement causes genetic erosion, reducing the available gene pool needed for breeding disease resistance and climate adaptation in future agricultural systems.

**101.** (B) First post-parturition milk rich in protective antibodies essential for calf immunity.
Colostrum is the specialized initial milk secreted by female mammals immediately following parturition. Thick and yellow-tinted,

travel infrastructure, visitor limits, and direct community involvement in conservation financial gains.

**83.** (C) 2021
The Government of Rajasthan officially released the Rajasthan Ecotourism Policy in July 2021. Designed to harness the state's diverse natural heritage sustainably, the policy aims to develop ecotourism infrastructure across forest areas, wildlife sanctuaries, and wetlands. It emphasizes biodiversity conservation, local tribal empowerment, environmental education, and private-public partnerships over a ten-year operational horizon.

**84.** (C) Habituation of wild animals to human feeding, making them docile
Ecotourism aims to preserve natural animal behavior without disrupting wild ecosystems. Feeding wild animals causes habituation, alters natural foraging instincts, increases aggression, and disrupts wild food chains, making it an unwanted negative consequence. Valid objectives of biodiversity-based ecotourism include creating sustainable local livelihoods, raising environmental awareness, and generating conservation revenue for protected area management.

**85.** (A) Growing food crops and forest trees together on the same land unit.
Agrisilviculture is an agroforestry model combining the deliberate cultivation of agricultural food crops alongside woody forest trees on the same land management unit. This dual land-use system enhances overall ecological productivity through nutrient cycling, provides shade and microclimate regulation, reduces soil erosion, and yields diversified economic returns through simultaneous harvests of crops, timber, and fuelwood.

**86.** (A) Shearing → Scouring → Sorting → Carding → Spinning
Wool processing follows a precise linear sequence. Fleece is first shorn from live sheep during shearing, then thoroughly washed in detergent baths during scouring to remove grease and dirt. Scoured wool undergoes sorting to separate fibers by length and texture, followed by carding to align fibers into webs, and finally spinning to produce usable yarn.

**87.** (B) Washing the raw wool with detergents to remove grease (lanolin), dirt, and sweat
Scouring is an essential initial cleaning operation in wool processing. Raw shorn fleece contains high levels of contaminants, including natural wool grease or lanolin, suint from sweat, dirt, vegetable matter, and dried dung. Scouring involves passing raw wool through continuous warm water wash liquor containing mild alkalis and detergents, producing clean, degreased fiber suitable for downstream processing.

**88.** (C) Reduction of soil erosion and improvement of microclimate
Integrating perennial trees into agricultural landscapes provides major ecological benefits. Deep tree root systems stabilize topsoil, reducing wind and water erosion, while fallen leaf litter enriches soil organic matter and improves water retention. Furthermore, tree canopies moderate local temperature extremes, reduce evaporation rates, create favorable microclimates, and enhance overall biodiversity within agro-ecosystems.

**89.** (C) Trees + Forage/Pasture grasses + Livestock
Silvopasture is an integrated agroforestry practice combining three core components: perennial timber or fodder trees, nutritious pasture grasses or legumes, and grazing livestock on the same land. Trees offer shade and shelter to animals while yielding wood products, while underlying forage grasses sustain livestock grazing, creating an ecologically balanced system that maximizes farm productivity.

**90.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Agroforestry systems serve as effective natural climate change mitigation mechanisms in agriculture. Integrating long-lived woody perennial trees into croplands facilitates substantial carbon sequestration. Trees absorb atmospheric carbon dioxide through photosynthesis, permanently storing carbon in their wood biomass, root networks, and surrounding soils, thereby offsetting agricultural greenhouse gas emissions while building farm resilience.

**91.** (C) Seeds/Kernels
Cold-pressed neem oil is extracted from dried seeds and kernels of Azadirachta indica trees. Neem kernels contain high concentrations of

Click Here to Buy book on Flipkart

coagulation, chemical compounding with carbon black and sulfur, thermal molding, and vulcanization, reflecting increasing processing complexity.

**111.** (A) Bacopa monnieri (Brahmi)
Bacopa monnieri, commonly known as Brahmi, is an important Ayurvedic medicinal herb recognized as a cognitive enhancer and brain tonic. The plant contains active triterpenoid saponins called bacosides. Bacosides enhance synaptic transmission, promote neural tissue repair, improve memory retention, reduce anxiety, and protect central nervous system function against oxidative stress.

**112.** (B) It permits the unhindered commercial trade of ivory within Indian borders.
The Wildlife Protection Act of 1972 imposes strict bans on domestic and international commercial trade in ivory and elephant products to prevent poaching. It establishes legal frameworks for designating National Parks and Wildlife Sanctuaries, prohibits hunting listed species under Schedule I, and strictly regulates commercial transactions involving wild animal parts, specimens, and trophies.

**113.** (C) Trees, agricultural crops, and livestock/ pasture simultaneously
Agrosilvopasture is an integrated land management model that combines three agricultural components: woody perennial forest trees, cultivated agricultural food crops, and livestock grazing or forage pasture production on the same land unit. This system optimizes resource use, enhances biodiversity, protects topsoil, and provides rural landholders with diversified income streams across multiple seasons.

**114.** (B) Growing consumer demand for pesticide-free food produces strong price premiums.
Organic farming is expanding commercially due to rising global consumer demand for food grown without synthetic chemical pesticides, herbicides, or artificial fertilizers. Heightened health awareness and environmental concerns lead consumers to pay premium prices for certified organic produce, driving market growth and providing higher profit margins for certified organic farmers.

**115.** (C) It fixes free atmospheric nitrogen into ammonia as an unattached soil organism.
Azotobacter is a free-living, aerobic, nitrogen-fixing bacterium utilized as an effective agricultural biofertilizer. Unlike Rhizobium, Azotobacter operates independently in the rhizosphere without forming plant root nodules. It converts atmospheric nitrogen gas into ammonium ions in the soil, synthesizing growth-promoting substances like auxins and gibberellins that enhance growth in non-leguminous crops like wheat.

**116.** (B) A National Park has a higher degree of legal protection and stricter restrictions on human activity than a Wildlife Sanctuary.
In Indian conservation law, National Parks enjoy a higher degree of legal protection than Wildlife Sanctuaries. No human activities, including livestock grazing, timber felling, or private land ownership, are permitted inside National Parks unless specifically authorized. Wildlife Sanctuaries allow limited human activities like regulated cattle grazing and traditional resource collection if they do not harm wildlife.

**117.** (B) A high-profile species used to raise public support, funds, and habitat conservation.
A flagship species is a prominent, charismatic animal species, such as the Bengal tiger or Asian elephant, chosen to anchor public conservation campaigns. In conservation economics, flagship species generate public sympathy, attract tourist interest, and secure funding. Protecting their extensive natural ranges indirectly conserves whole ecosystems and less prominent species sharing that habitat.

**118.** (A) Jharkhand
Jharkhand is the leading producer of raw lac in India, accounting for over fifty percent of national production annually. Abundant natural host trees such as Palash, Kusum, and Ber across forested regions, combined with traditional tribal lac cultivation practices, sustain Jharkhand's leading position in raw sticklac and seedlac output.

**119.** (C) Caryopsis
Botanically, a cereal grain is a dry, single-seeded, indehiscent fruit classified as a caryopsis. In a caryopsis, the outer pericarp or fruit wall is fused with the underlying seed coat or testa, forming a protective layer around the starchy endosperm

Downloaded from www.pdf.tube

and nutrient-rich embryo, characteristic of members of the Poaceae family.

**120.** (A) Morphine (from Papaver somniferum)
Morphine is a naturally occurring benzylisoquinoline alkaloid extracted from the dried latex of opium poppy unripe seed capsules, Papaver somniferum. Functioning as a potent central nervous system analgesic, morphine acts on opioid receptors to relieve severe pain in clinical medicine. It represents a classic bioactive plant alkaloid with profound human physiological effects.

**121.** (B) National Dairy Development Board (NDDB)
Operation Flood, also known as the White Revolution, was planned and executed by the National Dairy Development Board under the leadership of Dr. Verghese Kurien. Launched in 1970, this dairy development program linked rural milk producers with urban consumers through a nationwide cooperative network, transforming India into the world's largest producer of milk.

**122.** (A) P-4, Q-2, R-1, S-3
Saffron is obtained from dried flower stigmas of Crocus sativus. Coir is a fibrous material extracted from coconut fruit mesocarp. Shellac is processed from resinous secretions of female lac insects, and natural silk is harvested from unemerged silkworm cocoons spun by mature caterpillars.

**123.** (C) Triticum aestivum
Triticum aestivum, commonly known as hexaploid bread wheat, accounts for approximately ninety-five percent of global wheat production. Its flour contains balanced glutenin and gliadin storage proteins that provide dough elasticity and gas-retention properties, making Triticum aestivum ideal for industrial baking of leavened breads, baked goods, and flour products worldwide.

**124.** (B) Cymbopogon nardus (Citronella)
Cymbopogon nardus, commonly known as Citronella grass, is an aromatic perennial grass cultivated to extract citronella essential oil through steam distillation. Rich in citronellal, geraniol, and citronellol, this volatile oil exhibits strong insect-repellent properties, making it a primary active ingredient in commercial natural mosquito repellents, sprays, and candles.

**125.** (B) Managing severe hypertension and controlling selected psychiatric conditions.
Reserpine is an indole alkaloid extracted from roots of the medicinal plant Rauvolfia serpentina, commonly known as Sarpagandha. Reserpine depletes catecholamines in sympathetic nerve terminals, lowering peripheral vascular resistance to treat severe hypertension. It also exerts tranquilizing effects on the central nervous system, historically serving as an antihypertensive and antipsychotic drug.

**126.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Cultivating leguminous crops reduces agricultural reliance on synthetic chemical nitrogen fertilizers. Legumes form a symbiotic association with Rhizobium bacteria residing within root nodules. These bacteria fix atmospheric nitrogen gas into ammonium, satisfying crop nitrogen needs and leaving residual nitrogen in the soil, which enriches soil fertility for subsequent crop cycles.

**127.** (C) Exercising monopoly control over the retail pricing of all Ayurvedic medicines in India
The National Medicinal Plants Board coordinates conservation, sustainable cultivation, resource mapping, and financial support for medicinal plant farming. NMPB does not exercise pricing control over commercial retail Ayurvedic pharmaceuticals, a task regulated by the National Pharmaceutical Pricing Authority and drug control agencies, making statement C an incorrect objective.

NODIA

**128.** (B) The overcrowding of the colony, leading the old queen and a large group of workers to leave and establish a new colony
Swarming is a natural colony reproduction process in honey bees triggered by hive overcrowding, abundant nectar flow, and high population density. The reigning queen, accompanied by a large proportion of older worker bees, leaves the parent hive to locate and establish a new nest site, leaving behind developing queen cells and remaining workers.

**129.** (C) Karl von Frisch
Austrian ethologist Karl von Frisch decoded the communication language of honey bees, earning the Nobel Prize in Physiology or Medicine in 1973. He demonstrated that worker bees perform structured movements, known as the "waggle dance" and "round dance," inside the hive to

communicate precise distance, direction, and quality of distant floral food sources.

**130.** (B) Khejri and Camel
The official State Tree of Rajasthan is Khejri (Prosopis cineraria), designated for its ecological importance in desert environments. The State Animal under the livestock category is the Camel (Camelus dromedarius), officially recognized in 2014 to safeguard camel populations and highlight their cultural and economic role in the state's arid heritage.

**131.** (B) Acacia senegal (Kummat)
Acacia senegal is a major source of true Gum Arabic, a natural water-soluble polysaccharide exudate. True plant gums dissolve or swell in water to form mucilaginous gels, whereas natural resins, such as those obtained from pine trees, are insoluble in water but soluble in organic solvents, distinguishing gums from resins.

**132.** (B) I and III only
Micropropagation tissue culture enables rapid mass multiplication of elite banana and orchid cultivars. Biopesticides are target-specific and environmentally safer than broad-spectrum chemicals. Genetically modified crops are subject to strict statutory regulation by the Genetic Engineering Appraisal Committee in India, making statements I and III correct.

**133.** (B) Delayed ripening and increased shelf life
The Flavr Savr tomato was engineered to extend post-harvest shelf life and delay soft ripening. Scientists inserted an antisense gene that suppressed polygalacturonase expression, an enzyme responsible for degrading cell wall pectin during ripening. Suppressing this enzyme allowed fruit to remain firm longer during transport, reducing post-harvest spoilage losses.

**134.** (C) Sugarcane
Sugarcane is classified as an industrial commercial cash crop grown primarily for processing sucrose, sugar, and ethanol. In contrast, rice, wheat, and maize are food grain cereals cultivated primarily to provide basic dietary starch and staple food security for human populations, distinguishing sugarcane from basic food grain categories.

**135.** (D) Laying thousands of eggs daily to maintain or expand the colony population
The queen bee is the sole fertile female in a honey bee hive, responsible for laying eggs to maintain and expand the colony population. A healthy queen can lay over fifteen hundred eggs daily during peak seasons, secreting queen mandibular pheromones that regulate social hierarchy, suppress worker ovary development, and maintain colony cohesion.

**136.** (C) Fisheries and aquaculture
The Blue Revolution in India was a targeted national initiative launched to modernize and expand the fisheries and aquaculture sectors. By promoting scientific fish farming, inland aquaculture infrastructure, brackish water shrimp culture, and marine capture technology, the policy increased fish production, boosted export earnings, and enhanced food security across coastal and inland regions.

**137.** (C) It endures severe drought while supplying edible pods, livestock fodder, and fuelwood in arid zones.
Prosopis cineraria, locally called Khejri, is known as the "Kalpavriksha of the Thar Desert" due to its utility in arid ecosystems. Featuring deep taproots, Khejri withstands severe droughts while enriching soil nitrogen. It provides Sangri pods for human nutrition, nutrient-rich Loom foliage for livestock fodder, and quality firewood, sustaining desert agrarian economies.

**138.** (A) I, II, and III
Sugarcane is a sucrose-yielding grass, cotton produces natural cellulosic seed fibers, and tea and coffee are beverage crops containing caffeine alkaloids. Jute is a natural bast plant fiber extracted from plant stems rather than a synthetic chemical fiber, making statements I, II, and III correct.

**139.** (B) Rajasthan
Rajasthan is the primary producer of coarse carpet-grade wool in India, producing over forty percent of total raw wool nationwide. Indigenous sheep breeds like Chokla, Magra, Marwari, and Pugal produce durable, resilient wool fibers with high medullation, ideal for processing into woven carpets, rugs, and industrial felts.

**140.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Agroforestry models build economic resilience for smallholder farmers by integrating trees with food crops and livestock. This approach diversifies farm output, generating multiple revenue

Click Here to Buy book on Amazon

streams through timber, fruit, fodder, and crops. Diversification buffers farm households against single-crop losses caused by unseasonal weather, pest outbreaks, or market price fluctuations.

www.nodia.in

NODIA

# CHAPTER 13

# Agriculture and Horticulture with Special Reference to Rajasthan

**1.** What is the approximate contribution of the agriculture and allied sector to the Gross State Value Added (GSVA) of Rajasthan at constant prices (2011-12)?
(A) 15 to 18 percent
(B) 28 to 30 percent
(C) 42 to 45 percent
(D) 50 to 55 percent

**2.** Consider the following statements regarding the role of agriculture in India's economy:
**Statement I:** The agriculture sector absorbs the majority of the Indian workforce despite its declining share in the overall GDP.
**Statement II:** Capital formation in agriculture as a percentage of agricultural GDP has consistently remained above 40% over the last decade.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**3.** Which of the following is NOT classified under the 'Agriculture and Allied Sectors' for calculating Gross Value Added (GVA)?
(A) Crop husbandry and cultivation
(B) Forestry and timber logging
(C) Agro-based food processing
(D) Fishing and marine aquaculture

**4.** Consider the following statements regarding the linkage between agriculture and industry in the Indian economy:
I. Agriculture provides raw materials to principal agro-based industries like textiles and sugar.
II. A prosperous agricultural sector provides a captive market for industrial goods like fertilizers, tractors, and consumer products.
III. The agriculture sector acts as a net importer of industrial capital, contributing negatively to the foreign exchange reserves.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**5.** In agricultural economics, what is meant by 'Gross Capital Formation' in agriculture?
(A) The total annual value of operational subsidies and direct cash transfers provided by the central government
(B) The total gross revenue generated annually from the international export of major agricultural commodities
(C) Net addition to fixed physical assets like irrigation networks, farm machinery, and storage structures
(D) The total working capital required by farmers to purchase seeds, fuel, and fertilizers for a single crop season

**6.** Match List I with List II and select the correct answer using the codes given below:
**List I: Soil Type (USDA Classification)**
P. Aridisols
Q. Alfisols
R. Vertisols
S. Inceptisols
**List II: Dominant Region in Rajasthan**
1. Hadoti region (Kota, Bundi, Baran, Jhalawar)
2. Western dry region (Jaisalmer, Bikaner)
3. Eastern plains (Jaipur, Alwar, Bharatpur)
4. Semi-arid to sub-humid region (Sirohi, Pali, Rajsamand)
(A) P-2, Q-4, R-1, S-3
(B) P-2, Q-3, R-1, S-4
(C) P-3, Q-2, R-4, S-1
(D) P-1, Q-3, R-2, S-4

Downloaded from www.pdf.tube

to chemical fertilizers.
II. Chemical fertilizers improve the physical structure and water-holding capacity of the soil, unlike organic manure.
III. Organic manure releases nutrients slowly to the soil over a longer period.
IV. Continuous overuse of chemical fertilizers can degrade soil health and alter soil pH.
Which of the above statements is/are correct?
(A) I, II, and III only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

**44.** What is the percentage of Nitrogen present in standard agricultural grade Urea?
(A) 21%
(B) 33%
(C) 46%
(D) 60%

**45.** Consider the following statements regarding fertilizer application:
**Statement I:** The universally recommended ideal ratio of Nitrogen, Phosphorus, and Potassium (N:P:K) for cereal crops is 4:2:1.
**Statement II:** In Rajasthan, farmers generally over-apply Potassium and neglect Nitrogen in their fertilizer use.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**46.** Which of the following pairs of Fertilizer and the primary nutrient it provides is incorrectly matched?
(A) Muriate of Potash (MOP) — Potassium
(B) Single Super Phosphate (SSP) — Phosphorus
(C) Calcium Ammonium Nitrate (CAN) — Nitrogen
(D) Diammonium Phosphate (DAP) — Potassium

**47.** A farmer wishes to apply a basal dose of fertilizer at the time of sowing wheat. Which of the following fertilizers is most appropriate to provide both Nitrogen and Phosphorus simultaneously right at the root zone?
(A) Diammonium Phosphate (DAP)
(B) Urea (Granular Nitrogen source)
(C) Muriate of Potash (MOP fertilizer)
(D) Zinc Sulphate Micronutrient formulation

**48.** Which district of Rajasthan was formally declared as the state's first fully organic farming district?
(A) Banswara
(B) Dungarpur
(C) Pratapgarh
(D) Udaipur

NODIA

**49.** Which of the following is the most appropriate description of the primary goal of organic farming?
(A) To aggressively maximize immediate crop productivity and farm yields through high applications of synthetic chemical inputs
(B) To maintain long-term soil health using natural inputs rather than synthetic chemicals
(C) To rely predominantly on biotechnology and transgenic genetically modified crop strains engineered for high pest resistance
(D) To transition farming systems completely away from traditional food grain production toward commercial cash crops

**50.** Consider the following principles of organic agriculture as defined by international bodies:
I. Principle of Health
II. Principle of Ecology
III. Principle of Chemical Augmentation
Which of the above statements is/are correct regarding the core principles of organic farming?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**51.** The process of enhancing organic waste decomposition and producing nutrient-rich compost using various species of earthworms is known as:
(A) Biodynamic farming
(B) Bokashi composting
(C) Vermicomposting
(D) Green manuring

**52.** Which of the following inputs is NOT permitted for use in certified organic farming?
(A) De-oiled neem cake residue
(B) Liquid Rhizobium biofertilizer culture

(C) Long-staple cotton
(D) Mustard oilseed

**17.** Which of the following crops is NOT typically classified as a Kharif crop in Rajasthan?
(A) Pearl Millet (Bajra)
(B) Linseed (Alsi)
(C) Maize (Makka)
(D) Green Gram (Moong)

**18.** What is the approximate rank of Rajasthan in the production of Pearl Millet (Bajra) in India?
(A) First
(B) Second
(C) Third
(D) Fourth

**19.** Consider the following statements regarding wheat cultivation in Rajasthan:
**Statement I:** Wheat requires cool and moist weather during its vegetative growth phase and dry, warm weather during maturity.
**Statement II:** Sri Ganganagar and Hanumangarh are among the leading wheat-producing districts in Rajasthan.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**20.** Consider the following statements about Jowar (Sorghum) cultivation in Rajasthan:
I. It is primarily cultivated in the central and southeastern districts such as Ajmer, Tonk, and Bhilwara.
II. It is known as the "camel crop" because of its high resistance to drought conditions.
III. It is cultivated exclusively as a commercial cash crop and never for fodder.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**21.** Which is the most appropriate reason for Pearl Millet (Bajra) being extensively cultivated in the western districts of Rajasthan?
(A) It uniquely thrives in poorly drained, clay-heavy, water-logged soils abundant across western Rajasthan.
(B) The state agricultural department strictly mandates bajra cultivation in western districts by law.
(C) It is exceptionally drought-tolerant and well-adapted to dry, sandy soils.
(D) It relies on extended spells of intense winter frost and low temperatures to achieve maturity.

**22.** Select the correct descending order of the following districts of Rajasthan in terms of average annual wheat production:
(A) Sri Ganganagar, Hanumangarh, Alwar
(B) Alwar, Hanumangarh, Sri Ganganagar
(C) Hanumangarh, Alwar, Sri Ganganagar
(D) Sri Ganganagar, Alwar, Hanumangarh

**23.** 'Raj 3077', 'Kalyan Sona', and 'Sonalika' are prominent high-yielding varieties of which major food crop grown in Rajasthan?
(A) Maize
(B) Barley
(C) Bajra
(D) Wheat

**24.** Match List I with List II and select the correct answer using the codes given below:
**List I: Cash Crop**
P. American Cotton
Q. Isabgol
R. Soybean
S. Mustard
**List II: Leading Producing District/Region in Rajasthan**
1. Alwar and Bharatpur
2. Kota, Bundi, and Baran
3. Jalore and Barmer
4. Sri Ganganagar and Hanumangarh
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-3, R-2, S-4

**25.** Guar (Cluster bean) is a major cash crop of Rajasthan. The 'Guar gum' extracted from its seeds is primarily used in which of the following industrial applications globally?
(A) Industrial manufacturing of synthetic rubber products
(B) Commercial production of solar photovoltaic cells
(C) Shale gas extraction via hydraulic fracturing

Click Here to Buy book on Flipkart

(A) The mechanical tillage practice of turning over topsoil to expose buried crop pests and weed seeds to solar heat
(B) The systematic pruning of upper canopy branches on fruit trees to encourage wider horizontal lateral growth
(C) Covering soil with organic or synthetic material to retain moisture and control weeds
(D) The direct drill sowing of agricultural crop seeds into completely unploughed and undisturbed field soil

**62.** Consider the following statements regarding the use of anti-transpirants in dryland farming:
**Statement I:** Anti-transpirants are chemicals applied to plant foliage to reduce the rate of transpiration without significantly affecting photosynthesis.
**Statement II:** Potassium based compounds and certain waxes are commonly used as anti-transpirants to help crops survive dry spells.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**63.** Select the correct order of the following traditional water harvesting structures of Rajasthan from generally smallest/shallowest to largest/deepest capacity:
(A) Toba, Nadi, Talab
(B) Talab, Nadi, Toba
(C) Nadi, Toba, Talab
(D) Toba, Talab, Nadi

**64.** Match List I with List II and select the correct answer using the codes given below:
**List I: Branch of Horticulture**
P. Olericulture
Q. Pomology
R. Floriculture
S. Viticulture
**List II: Field of Study/Production**
1. Cultivation of grapes
2. Cultivation of vegetables
3. Cultivation of fruits
4. Cultivation of ornamental flowers
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-2, Q-4, R-3, S-1
(D) P-4, Q-3, R-2, S-1

**65.** Which branch of horticulture deals primarily with the cultivation, management, and study of individual trees, shrubs, and woody plants for aesthetic purposes?
(A) Silviculture management
(B) Arboriculture
(C) Agronomy science
(D) Olericulture science

NODIA

**66.** The term "Horticulture" is derived from the Latin words 'Hortus' and 'Cultura'. What is the meaning of 'Hortus'?
(A) Garden
(B) Plant vegetation
(C) Food crops
(D) Natural beauty

**67.** Identify the odd one out from the following list of crops, considering the standard classification of plantation vs standard horticultural fruit crops in India:
(A) Mango
(B) Guava
(C) Rubber
(D) Pomegranate

**68.** In the context of horticulture, what is the primary focus of 'Post-Harvest Technology'?
(A) Breeding and developing superior high-yielding hybrid seed varieties for planting during subsequent cropping seasons
(B) Applying chemical and thermal soil sterilization treatments immediately following the completion of crop harvest
(C) Promoting and executing real estate transactions for agricultural farmland following the main harvest season
(D) Extending shelf life and adding value to produce through proper handling, processing, and packaging

**69.** Which district in Rajasthan is the leading producer of 'Kinnow', a high-yield mandarin hybrid?
(A) Jhalawar district
(B) Banswara district
(C) Sri Ganganagar
(D) Udaipur district

**70.** Rajasthan holds a near monopoly in India in the production of Isabgol (Psyllium husk). Which of

Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**35.** Which of the following modern irrigation methods is most appropriate for cultivating crops on highly undulating (uneven) land without requiring extensive land levelling?
(A) Furrow irrigation
(B) Border strip irrigation
(C) Sprinkler irrigation
(D) Basin irrigation

**36.** Match List I with List II and select the correct answer using the codes given below:
**List I: Old name of IGNP Lift Canal**
P. Bikaner-Lunkaransar Lift Canal
Q. Nohar-Sahawa Lift Canal
R. Phalodi Lift Canal
S. Gajner Lift Canal
**List II: New Name**
1. Guru Jambheshwar Lift Canal
2. Panna Lal Barupal Lift Canal
3. Kanwar Sen Lift Canal
4. Chaudhary Kumbharam Lift Canal
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-1, R-4, S-2
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-4, R-1, S-2

**37.** Arrange the following lift canals of the Indira Gandhi Canal Project (IGNP) from North to South geographically:
I. Chaudhary Kumbharam Lift Canal
II. Dr. Karni Singh Lift Canal
III. Jai Narayan Vyas Lift Canal
IV. Kanwar Sen Lift Canal
Which of the following is the correct order?
(A) I, IV, II, III
(B) I, II, IV, III
(C) IV, I, III, II
(D) II, I, IV, III

**38.** The Indira Gandhi Canal draws its water primarily from which of the following barrages?
(A) Bhakra Nangal Dam
(B) Harike Barrage
(C) Pong Dam
(D) Gandhi Sagar Dam

**39.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The problem of waterlogging and soil salinity, locally known as 'Sem', has become a major ecological issue in the IGNP command area.
**Reason (R):** Excessive canal irrigation without adequate drainage in areas with hardpan subsoils causes the groundwater table to rise rapidly.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**40.** Which of the following districts of Rajasthan is NOT served by the lift canals or branches of the Indira Gandhi Canal Project (IGNP)?
(A) Jhalawar
(B) Jodhpur district
(C) Churu district
(D) Bikaner district

**41.** What is the total length of the Rajasthan Feeder Canal, which carries water from its origin to the head of the main canal at Masitawali Head?
(A) 204 km
(B) 445 km
(C) 649 km
(D) 820 km

NODIA

**42.** In agricultural terminology, what is 'Green Manure'?
(A) Green plants ploughed into the soil to improve organic fertility
(B) Fresh, uncomposted animal dung and farm wastes applied directly to field soil without decomposition
(C) Completely synthetic chemical fertilizers synthesized exclusively using renewable green energy sources
(D) Dry plant residues and stubble left standing in fields following the completion of grain harvesting

**43.** Consider the following statements comparing organic manure and chemical fertilizers:
I. Organic manures are bulky and have low nutrient content per unit of weight compared

**7.** The medium black soil found extensively in the southeastern part of Rajasthan is most suitable for the cultivation of which of the following crop combinations?
(A) Pearl millet and Moth bean
(B) Barley and Isabgol
(C) Guar and Cumin
(D) Soybean and Cotton

**8.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The soils of western Rajasthan are highly prone to salinity and alkalinity.
**Reason (R):** High temperature, high evaporation rates, and capillary action draw dissolved underground salts to the soil surface.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**9.** Identify the odd one out among the following soil classifications found in Rajasthan based on traditional nomenclature:
(A) Sireozem
(B) Revrina
(C) Laterite
(D) Gypsiferrous

**10.** Which of the following statements accurately describes the Red-Yellow soils of Rajasthan found in districts like Sawai Madhopur, Bhilwara, and Ajmer?
(A) They are formed by granite-gneiss weathering and are low in organic humus content.
(B) They contain exceptionally high natural concentrations of organic humus, nitrogen, and phosphorus compounds.
(C) Their characteristic red coloration is caused by deep surface layers containing dense calcium carbonate nodules.
(D) They exhibit the highest overall clay proportion and moisture-holding capacity among all soil types in the state.

**11.** Entisols, which lack well-developed soil horizons, are predominantly found in which geographical division of Rajasthan?
(A) Aravalli Hill Region
(B) Eastern Plains
(C) Hadoti Plateau
(D) Western Sandy Plains

**12.** In Rajasthan, the Rabi crops are generally sown during which of the following periods?
(A) June to July
(B) October to November
(C) March to April
(D) January to February

**13.** Consider the following characteristics of Zaid crops:
I. They are grown primarily between the Rabi and Kharif seasons.
II. The typical crops include watermelon, muskmelon, cucumber, and fodder crops.
III. They require long periods of cold weather and low temperatures for growth.
IV. They are predominantly grown in areas with assured irrigation facilities.
Which of the above statements is/are incorrect?
(A) I and II only
(B) III only
(C) II and IV only
(D) I, III, and IV only

**14.** Which of the following pairs of Crop and its typical Agricultural Season in Rajasthan is correctly matched?
(A) Groundnut — Rabi
(B) Gram (Chickpea) — Kharif
(C) Barley — Zaid
(D) Mustard — Rabi

**15.** Arrange the following fundamental agricultural practices in the correct chronological sequence from the beginning of a crop season:
I. Sowing
II. Preparation of soil
III. Irrigation
IV. Adding manure and fertilizers
Which of the following is the correct sequence?
(A) II, I, IV, III
(B) II, IV, I, III
(C) I, II, III, IV
(D) I, IV, II, III

**16.** Which of the following is primarily cultivated as a Zaid crop in Rajasthan to provide green fodder for livestock during the hot summer months?
(A) Bread wheat crop
(B) Sorghum (Chari)

Downloaded from www.pdf.tube

(C) Composted Farm Yard Manure (FYM)
(D) Phorate

**53.** The term 'Mixed Farming' in agricultural science strictly refers to:
(A) Cultivating two or more distinct crop species simultaneously on the exact same piece of agricultural land
(B) Growing a planned succession of different crop types sequentially across successive seasons on the same land
(C) Combining crop cultivation with livestock rearing
(D) Integrating perennial forestry and timber tree production directly alongside seasonal arable crop farming

**54.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Including a leguminous crop in the crop rotation cycle is highly recommended for sustainable farming.
**Reason (R):** Leguminous crops form symbiotic relationships with root-nodule bacteria that fix atmospheric nitrogen into the soil.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**55.** A farmer in Rajasthan has grown an exhaustive cereal crop (like Bajra) that heavily depleted soil nitrogen. Which of the following crops should be chosen for the next rotation to naturally restore soil fertility?
(A) High-yielding irrigated wheat
(B) Hybrid grain maize crop
(C) Sorghum grain crop
(D) Moong bean

**56.** Which of the following statements incorrectly distinguishes between mixed cropping and intercropping?
(A) Harvesting and threshing of individual crops are much easier in mixed cropping compared to intercropping.
(B) Mixed cropping involves mixing seeds before sowing, while intercropping involves sowing crops in definite row patterns.
(C) The primary objective of mixed cropping is to minimize risk of total crop failure, whereas intercropping aims to optimize productivity per unit area.
(D) Intercropping generally requires more precise application of fertilizers and pesticides than mixed cropping.

**57.** The agricultural practice where seeds of the succeeding crop are sown in a standing crop before the harvesting of the preceding crop is known as:
(A) Ratoon cropping
(B) Strip cropping
(C) Relay cropping
(D) Cover cropping

**58.** Dryland agriculture involves the cultivation of crops in regions where the annual rainfall is generally less than:
(A) 250 mm
(B) 500 mm
(C) 750 mm
(D) 1150 mm

**59.** Consider the following techniques used in agriculture:
I. Deep summer ploughing
II. Mulching
III. Extensive use of flood irrigation
IV. Contour bunding
Which of the above represents standard moisture conservation practices used in dryland farming?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, II, and IV only
(D) I, III, and IV only

**60.** What is the best description of the purpose of contour bunding in dryland agriculture?
(A) To serve strictly as permanent physical boundaries demarcating property lines between adjacent farm holdings
(B) To capture surface runoff, control soil erosion, and boost moisture
(C) To excavate deep structural channels required for laying underground pressurized canal irrigation pipelines
(D) To act as windbreaks shielding standing crops from extreme heatwaves and severe summer winds known as Loo

**61.** In agricultural terminology, what is 'Mulching'?

NODIA

(D) Primary refining process of crude petroleum oil

**26.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Eastern districts of Rajasthan like Bharatpur and Alwar are major producers of Mustard.
**Reason (R):** These districts possess alluvial loamy soils and have a favorable cool climate during the Rabi season which is ideal for mustard cultivation.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**27.** The variety of cotton known as 'Bikaneri Narma' belongs to which species of cotton cultivated in Rajasthan?
(A) Gossypium arboreum
(B) Gossypium herbaceum
(C) Gossypium barbadense
(D) Gossypium hirsutum

**28.** Consider the following statements regarding Mustard cultivation in Rajasthan:
I. Rajasthan is the largest producer of mustard in India.
II. It requires high temperature and heavy rainfall throughout its growing period.
III. Frost during the flowering and pod formation stages causes severe damage to the crop.
IV. It is largely cultivated as a Kharif crop in the state.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and IV only
(D) I, III, and IV only

**29.** Identify the odd one out based on the economic classification of crops in Rajasthan:
(A) Sugarcane
(B) Tobacco
(C) Barley
(D) Cotton

**30.** If a farmer switches from traditional flood irrigation to drip irrigation for horticultural crops in Rajasthan, what is the generally accepted range of water savings expected?
(A) 5% to 10%
(B) 15% to 25%
(C) 40% to 70%
(D) 85% to 95%

**31.** What is the definition of 'Fertigation' in modern agricultural practices?
(A) Applying water-soluble or liquid fertilizers through an irrigation system
(B) Applying concentrated synthetic plant nutrients using high-altitude aerial foliage sprays
(C) Mixing well-decomposed organic manure thoroughly into field soil before sowing seeds
(D) Injecting specialized bio-fertilizer strains exclusively during the flowering stage of crops

**32.** Which of the following statements about sprinkler irrigation is incorrect?
(A) It is exceptionally well-suited for sandy soil types characterized by high infiltration rates.
(B) It is ideal for crops like rice requiring standing water.
(C) It is highly effective in shielding tender crops against severe micro-climatic frost conditions.
(D) It facilitates uniform and controlled water distribution across highly undulating topographies.

**33.** 'Chadas' (Moat), 'Rahat', and 'Dhekli' are terms associated with which of the following in rural Rajasthan?
(A) Traditional post-harvest structures used for storing food grains in rural areas
(B) Traditional water-lifting devices for irrigation
(C) Traditional indigenous implements designed specifically for deep field ploughing
(D) Traditional indigenous draught cattle breeds found in the western arid region

**34.** Consider the following statements regarding the benefits of Drip Irrigation:
I. It minimizes water loss due to evaporation and deep percolation.
II. It promotes extensive weed growth between crop rows due to widespread moisture.
III. It allows for the precise application of nutrients directly to the root zone.

Click Here to Buy book on Amazon

the following districts are the major producers of Isabgol?
(A) Kota and Baran
(B) Jalore and Barmer
(C) Jaipur and Dausa
(D) Bikaner and Churu

**71.** Consider the following statements regarding rose cultivation in Rajasthan:
I. Pushkar in Ajmer is famous for the commercial cultivation of the Chaiti (Damask) rose.
II. Khamnore in Rajsamand is another major center known for rose cultivation and rose water extraction.
III. Rose cultivation in Rajasthan is primarily rainfed and does not require irrigation.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**72.** Which of the following pairs of Fruit Crop and its major producing district/region in Rajasthan is incorrectly matched?
(A) Apple — Jaisalmer
(B) Orange — Jhalawar
(C) Pomegranate — Barmer/Jalore
(D) Custard Apple (Sitaphal) — Rajsamand/ Chittorgarh

**73.** Rajasthan consistently ranks first in India in the production of which of the following spices?
(A) Malabar black pepper
(B) Green small cardamom
(C) Cumin and coriander
(D) Aromatic dried cloves

**74.** Arrange the following steps of the horticultural fruit supply chain in the correct chronological order:
I. Grading and Sorting
II. Harvesting at optimal maturity
III. Pre-cooling to remove field heat
IV. Packaging and Transport
Which of the following is the correct order?
(A) II, III, I, IV
(B) II, I, III, IV
(C) I, II, III, IV
(D) III, II, I, IV

NODIA

**75.** How does the 'Greenhouse Effect' utilized in protected cultivation primarily benefit crop growth during winter months in Rajasthan?
(A) It completely blocks all incoming infrared solar radiation from penetrating the structure, maintaining cool temperatures.
(B) It artificially inflates the internal atmospheric pressure inside the growing chamber to stimulate rapid seed germination.
(C) It relies on active mechanical heating systems that continuously pump hot thermal fluids into deep soil heating pipes.
(D) It lets in short-wave sunlight while trapping long-wave thermal radiation, raising internal warmth.

**76.** Consider the following statements regarding the benefits of polyhouse farming:
I. It allows for off-season production of vegetables and flowers.
II. It provides protection against extreme weather conditions like frost, hail, and heavy rain.
III. It significantly reduces water consumption due to decreased evaporation.
IV. It guarantees complete immunity from all soil-borne pathogens without any soil treatment.
Which of the above statements is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

**77.** What is a 'Shade Net House' in the context of protected cultivation?
(A) A permanent greenhouse facility constructed entirely with reinforced clear sheet glass to maximize full sunlight exposure
(B) A subterranean reinforced concrete bunker designed specifically for commercial temperature-controlled mushroom production
(C) A framed structure covered with woven nets to shade crops from intense heat and radiation
(D) A low-cost temporary plastic tunnel installed directly over individual field crop rows to conserve humidity and soil moisture

**78.** Which of the following crops is considered the most economically viable and best suited for high-tech greenhouse cultivation in Rajasthan?
(A) Traditional rainfed staple food grain crops

**96.** What is the primary, most direct objective of issuing a Soil Health Card to a farmer?
(A) To issue a legally binding land tenure document that farmers can submit as collateral for institutional bank loans
(B) To assess soil nutrient levels and recommend crop-specific fertilizer doses
(C) To enforce the mandatory state purchase of pre-allocated quantities of chemical fertilizers from cooperative shops
(D) To systematically determine annual state land revenue tax obligations based on historical soil fertility grades

**97.** According to the revised guidelines of the Soil Health Card Scheme, what is the standard cycle period for the renewal/re-testing of soil samples for a holding?
(A) Every 6 months (Semi-annually)
(B) Every 2 years
(C) Every 5 years (Quinquennially)
(D) Every 10 years (Decennially)

**98.** What is the primary objective of the 'Mukhyamantri Krishak Sathi Yojana' implemented by the Government of Rajasthan?
(A) To compensate farmers and farm workers for death or disability during farm work
(B) To distribute fully subsidized modern tractors and heavy machinery to small and marginal farming households
(C) To supply high-yielding certified hybrid seeds free of cost to rainfed farmers prior to every Kharif season
(D) To guarantee comprehensive 100% state procurement for all harvested food grain crops at Minimum Support Prices

**99.** The 'Rajeev Gandhi Krishak Sathi Sahayata Yojana' functions primarily under the administrative purview of which mechanism in Rajasthan?
(A) The State Disaster Management and Relief Authority
(B) The Department of Animal Husbandry and Dairying
(C) Agricultural Marketing Board (Mandi Samitis)
(D) The Water Resources and Irrigation Department

**100.** Consider the following statements regarding the Rajasthan Agricultural Competitiveness Project (RACP):
**Statement I:** The project aims to sustainably increase agricultural productivity and farmer incomes through climate-resilient agriculture.
**Statement II:** The project is externally aided and funded by the World Bank.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**101.** Which of the following is NOT a typical component or objective of the Rashtriya Krishi Vikas Yojana (RKVY)?
(A) Incentivizing state governments to substantially scale up public investment allocation in agriculture and allied development sectors
(B) Providing complete operational flexibility and administrative autonomy to individual states for planning local agriculture schemes
(C) Transferring universal basic income to all rural families
(D) Strengthening post-harvest infrastructure, cold chain storage logistics, and farm mechanization across rural areas

**102.** Under the Rajasthan Mukhyamantri Krishak Sathi Yojana's 'Tarbandi' (wire fencing) component, what is the primary purpose of providing subsidies to farmers?
(A) To physically establish and secure permanent international border boundaries
(B) To protect standing crops from wild boars and stray animals
(C) To construct vertical structural trellis frames for cultivating creeper crops
(D) To construct perimeter security enclosures for commercial poultry farming

**103.** Select the correct chronological order of the launch years of the following major agricultural initiatives/schemes in India, from earliest to latest:
(A) Rashtriya Krishi Vikas Yojana (RKVY), Soil Health Card Scheme, PM KISAN Samman Nidhi
(B) PM KISAN Samman Nidhi, Soil Health Card Scheme, RKVY
(C) Soil Health Card Scheme, RKVY, PM

Downloaded from www.pdf.tube

and Wheat.
**Reason (R):** Zone I a experiences low, erratic rainfall and has sandy soils, while Zone IV a receives better rainfall and has soils with better moisture retention capacity.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**87.** Rhizobium bacteria form root nodules and fix atmospheric nitrogen primarily in a symbiotic relationship with which category of plants?
(A) Cereal crops
(B) Oilseed plants
(C) Fiber crops
(D) Legumes

**88.** 'Trichoderma viride' and 'Bacillus thuringiensis' (Bt) are widely used in agriculture. Under which category do they fall?
(A) Biopesticides
(B) Synthetic chemical fertilizers
(C) Endogenous plant growth regulators
(D) Selective synthetic weedicides

**89.** A farmer wants to use a biofertilizer for a non-leguminous cereal crop like wheat to help with nitrogen fixation. Which of the following should be recommended?
(A) Rhizobium
(B) Blue Green Algae
(C) Azotobacter
(D) Frankia

**90.** Consider the following statements regarding the benefits of biofertilizers:
I. They enhance the nutrient availability in the soil in an eco-friendly manner.
II. They completely substitute the need for irrigation water.
III. They improve soil texture and maintain the long-term fertility of the soil.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

**91.** Which of the following is NOT classified as a biofertilizer?
(A) Azospirillum
(B) Mycorrhiza (VAM)
(C) Azolla
(D) Endosulfan

**92.** Consider the following statements about Mycorrhiza in agriculture:
**Statement I:** Mycorrhiza is a symbiotic association between a fungus and the roots of a vascular plant.
**Statement II:** It significantly enhances the plant's ability to absorb water and relatively immobile nutrients like Phosphorus from the soil.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

NODIA

**93.** The nationwide 'Soil Health Card Scheme' was officially launched by the Prime Minister in 2015 from which place in Rajasthan?
(A) Pokhran (Jaisalmer district)
(B) Pushkar (Ajmer district)
(C) Suratgarh
(D) Mandore (Jodhpur district)

**94.** What is the official slogan (motto) of the Soil Health Card Scheme?
(A) Jai Jawan, Jai Kisan, Jai Vigyan
(B) Per Drop More Crop initiative
(C) Mera Gaon, Mera Gaurav campaign
(D) Swasth Dhara, Khet Hara

**95.** Consider the following parameters tested under the Soil Health Card Scheme:
I. Macronutrients (N, P, K)
II. Secondary nutrients (S)
III. Micronutrients (Zn, Fe, Cu, Mn, Bo)
IV. Physical parameters (pH, EC, Organic Carbon)
Which of the above parameters are assessed in a standard Soil Health Card?
(A) I and IV only
(B) I, II, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

**113.** As per the current policy framework, the Government of India announces the Minimum Support Price (MSP) for how many mandated crops (excluding sugarcane)?
(A) 14
(B) 22
(C) 28
(D) 35

**114.** For which of the following commercial crops is the Minimum Support Price (MSP) NOT directly announced by the CACP, but rather its pricing is primarily governed by the Spices Board or open market dynamics?
(A) Cumin
(B) Raw Cotton
(C) Raw Jute crop
(D) Milled Copra

**115.** What is the fund-sharing pattern between the Central Government and the State Government of Rajasthan for the Mission for Integrated Development of Horticulture (MIDH)?
(A) 50:50
(B) 60:40
(C) 75:25
(D) 90:10

**116.** In Rajasthan, the implementation of the National Horticulture Mission at the state level is spearheaded by which nodal agency?
(A) Rajasthan State Seeds Corporation Limited (RSSCL)
(B) Rajasthan State Cooperative Marketing Federation (RAJFED)
(C) Central Arid Zone Research Institute (ICAR-CAZRI)
(D) Rajasthan Horticulture Development Society (RHDS)

**117.** Identify the correct statement regarding the Centres of Excellence established in Rajasthan under the Indo-Israel Agricultural Project:
(A) The Centre of Excellence for Pomegranate is located in Sriganganagar.
(B) The Centre of Excellence for Mango is located in Barmer.
(C) The Centre of Excellence for Citrus fruits is located at Nanta, Kota.
(D) All Centres of Excellence are strictly funded 100% by the State Government without external technical assistance.

**118.** Where is the Centre of Excellence for Date Palm established in Rajasthan?
(A) Devda (Jaisalmer)
(B) Sagra Bhojka
(C) Bassi region (Jaipur)
(D) Kheemvas village (Nagaur)

**119.** Which is the most appropriate description of the holistic focus of the National Horticulture Mission (NHM)?
(A) To focus exclusively on boosting international exports of fresh citrus fruits directly to European commercial markets
(B) To distribute free high-yielding vegetable seeds directly to all urban residential households for rooftop kitchen gardening
(C) To systematically replace traditional staple food grain crops with high-density horticultural plantation crops nationwide
(D) To ensure end-to-end growth of horticulture from production to marketing

**120.** The micro-irrigation component is promoted aggressively under the motto "Per Drop More Crop". This is a sub-component of which overarching national scheme?
(A) Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
(B) Rashtriya Krishi Vikas Yojana - Remunerative Approaches (RKVY-RAFTAAR)
(C) Pradhan Mantri Kisan Samman Nidhi central welfare scheme
(D) Mahatma Gandhi National Rural Employment Guarantee Act

**121.** Compared to traditional flood irrigation, the Water Use Efficiency (WUE) of drip irrigation systems is typically in the range of:
(A) 30-40%
(B) 50-60%
(C) 85-95%
(D) 100%

**122.** Which of the following statements regarding the subsidy structure for micro-irrigation systems (drip/sprinkler) in Rajasthan is incorrect?
(A) The state government does not provide any top-up subsidy; it relies entirely on the central grant.
(B) The scheme is implemented under PMKSY.
(C) Small and marginal farmers generally receive a higher percentage of subsidy compared to large farmers.
(D) Female farmers and those belonging to SC/

Click Here to Buy book on Flipkart

KISAN Samman Nidhi
(D) RKVY, PM KISAN Samman Nidhi, Soil Health Card Scheme

**104.** Under the Pradhan Mantri Fasal Bima Yojana (PMFBY), what is the maximum premium rate payable by farmers for all Kharif food and oilseed crops?
(A) 1.5% of the sum insured
(B) 2.0% of the sum insured
(C) 5.0% of the sum insured
(D) 10.0% of the sum insured

**105.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** PMFBY provides for assessing yield loss strictly at the individual farm level for all types of risks.
**Reason (R):** The scheme predominantly uses the "Area Approach" (e.g., Village/Panchayat level) for widespread calamities, while specific localized risks (like hailstorms) are assessed on an individual farm basis.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**106.** Which of the following statements regarding the coverage under Pradhan Mantri Fasal Bima Yojana (PMFBY) is incorrect?
(A) The scheme is currently mandatory for all farmers availing seasonal agricultural operations (SAO) crop loans.
(B) It covers post-harvest losses due to cyclonic and unseasonal rains for up to 14 days for crops left in the field to dry.
(C) It covers prevented sowing/planting risk due to deficit rainfall or adverse seasonal conditions.
(D) The premium for annual commercial and horticultural crops is fixed at a maximum of 5% for farmers.

**107.** If a farmer in Rajasthan insures a Rabi wheat crop with a total sum insured of ₹1,00,000 under PMFBY, what is the maximum premium amount the farmer has to pay out of pocket?
(A) ₹1,500
(B) ₹2,000
(C) ₹5,000
(D) The actual actuarial premium minus ₹500

**108.** What is the standard cut-off date for the enrolment of farmers for Kharif season crops under the PMFBY in Rajasthan?
(A) 31st March
(B) 15th July
(C) 31st July
(D) 30th September

**109.** Which central institution is responsible for recommending the Minimum Support Prices (MSP) for mandated agricultural crops to the Government of India?
(A) NITI Aayog
(B) National Bank for Agriculture and Rural Development (NABARD)
(C) Commission for Agricultural Costs and Prices (CACP)
(D) Food Corporation of India (FCI)

**110.** What does 'e-NAM' stand for in the context of agricultural marketing in India?
(A) Electronic National Agricultural Machinery
(B) Evaluation of Nutritional Agricultural Meals
(C) Export Network for Agricultural Materials
(D) Electronic National Agriculture Market

**111.** Which of the following statements correctly describes the function of the Rajasthan State Agricultural Marketing Board (RSAMB)?
(A) It develops and maintains mandi yards, rural link roads, and farmer rest houses.
(B) It directly buys all harvested agricultural produce from farmers at government Minimum Support Prices.
(C) It strictly regulates and monitors consumer retail prices of fresh vegetables in urban supermarkets.
(D) It functions exclusively to handle and process the export of raw agricultural commodities to foreign nations.

**112.** The Government of India announces a 'Fair and Remunerative Price' (FRP) instead of an MSP for which of the following crops?
(A) Raw Cotton
(B) Sugarcane
(C) Raw Jute
(D) Flue-cured Tobacco

Downloaded from www.pdf.tube

such as wheat, bajra, and barley
(B) Annual green fodder crops such as sorghum, berseem, and oats
(C) Commercial industrial cash crops such as sugarcane, cotton, and jute
(D) High-value exotic vegetables and cut flowers

**79.** Which of the following is NOT a characteristic feature of a naturally ventilated polyhouse?
(A) It requires continuous electricity to power automated fans and wet cooling pads.
(B) It relies primarily on manually or automatically operated side and roof vents to regulate internal air temperature and humidity.
(C) It demands significantly lower initial capital investment and operational maintenance costs than a climate-controlled greenhouse.
(D) It uses specialized UV-stabilized flexible polyethylene cladding film to cover the outer structural frame.

**80.** Consider the following statements regarding $CO_2$ enrichment in greenhouses:
**Statement I:** Maintaining higher than normal atmospheric levels of Carbon Dioxide inside a greenhouse can significantly increase the photosynthetic rate and crop yield.
**Statement II:** $CO_2$ enrichment is only effective if other factors like light intensity, water, and nutrients are adequately supplied to the plants.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**81.** For the purpose of agricultural planning and research, into how many agro-climatic zones has the state of Rajasthan been divided?
(A) 5
(B) 10
(C) 15
(D) 21

**82.** Match List I with List II and select the correct answer using the codes given below:
**List I: Agro-Climatic Zone Code**
P. Zone I a
Q. Zone II b
R. Zone III a
S. Zone V
**List II: Nomenclature / Region**
1. Arid Western Plain (Jodhpur, Barmer)
2. Transitional Plain of Luni Basin (Jalore, Pali)
3. Semi-Arid Eastern Plain (Jaipur, Ajmer)
4. Humid South-Eastern Plain (Kota, Jhalawar)
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-1, R-4, S-3
(C) P-1, Q-3, R-2, S-4
(D) P-4, Q-2, R-3, S-1

**83.** Which is the largest agro-climatic zone in Rajasthan by geographical area?
(A) Zone II a (Transitional Plain of Inland Drainage)
(B) Zone IV b (Humid Southern Plain)
(C) Zone I c (Hyper Arid Partial Irrigated Zone)
(D) Zone V (Humid South-Eastern Plain)

**84.** Which of the following statements correctly describes Agro-climatic Zone IV b (Humid Southern Plain) of Rajasthan?
(A) It consists almost entirely of northern irrigated alluvial canal command districts like Sriganganagar and Hanumangarh.
(B) It consistently records the absolute lowest annual rainfall totals and highest aridity levels across the entire state.
(C) It is topographically dominated by extensive shifting sand dunes and complete absence of surface water irrigation.
(D) It encompasses Banswara, Dungarpur, and Pratapgarh districts with significant tribal agriculture.

NODIA

**85.** Identify the odd one out among the following districts, as it does NOT fall under Agro-climatic Zone V (Humid South-Eastern Plain / Hadoti region):
(A) Kota district
(B) Jhalawar district
(C) Jaisalmer
(D) Baran district

**86.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The cropping pattern in Zone I a (Arid Western Plain) is heavily dominated by Bajra, Moth, and Guar, whereas Zone IV a (Sub-Humid Southern Plain) supports Maize

ST categories often receive preferential subsidy rates.

**123.** Which major irrigation project in Rajasthan was the first in India to mandate sprinkler irrigation for command area farmers to optimize water usage?
(A) Indira Gandhi Canal Project
(B) Bisalpur Dam Project
(C) Mahi Bajaj Sagar Project
(D) Narmada Canal Project

**124.** Consider the following statements about sub-surface drip irrigation:
**Statement I:** It involves burying lateral drip lines below the soil surface directly at the root zone.
**Statement II:** This method increases water loss due to surface evaporation compared to surface drip irrigation.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**125.** The Central Arid Zone Research Institute (CAZRI), a premier institute under ICAR dedicated to dryland research, is located in which city of Rajasthan?
(A) Bikaner
(B) Jaipur
(C) Jodhpur
(D) Udaipur

**126.** Swami Keshwanand Rajasthan State Agricultural University (SKRAU) is situated in:
(A) Jobner
(B) Kota
(C) Udaipur
(D) Bikaner

**127.** Which of the following pairs of Agricultural Research Centre and its location in Rajasthan is correctly matched?
(A) National Research Centre on Seed Spices — Tabiji (Ajmer)
(B) Directorate of Rapeseed-Mustard Research — Beechwal (Bikaner)
(C) Central Institute for Arid Horticulture — Sewar (Bharatpur)
(D) Arid Forest Research Institute (AFRI) — Jaipur

**128.** Maharana Pratap University of Agriculture and Technology (MPUAT) primarily caters to the agricultural research and extension needs of which region?
(A) Northern Rajasthan irrigated agricultural zone (Sriganganagar belt)
(B) Southern and South-Eastern Rajasthan (Mewar region)
(C) Western Arid and Semi-Arid Desert Region (Marwar area)
(D) Eastern Alluvial Plains and Foothill Zone (Matsya region)

**129.** Which of the following is NOT a designated State Agricultural University (SAU) or a dedicated Agriculture University in Rajasthan?
(A) Agriculture University, Kota
(B) Jai Narain Vyas University, Jodhpur
(C) Agriculture University, Jodhpur
(D) Sri Karan Narendra Agriculture University, Jobner

**130.** The Arid Forest Research Institute (AFRI), which works on increasing the vegetative cover and conserving biodiversity in the hot arid and semi-arid regions, is located in:
(A) Jodhpur
(B) Bikaner
(C) Barmer
(D) Jaisalmer

**131.** In the context of Rajasthan's agriculture, 'Crop Diversification' is best defined as:
(A) Systematically transitioning farm operations from diversified multiple cropping to strict monoculture farming
(B) Permanently converting active fertile agricultural land holdings into commercial and industrial development zones
(C) Adding new crops or cropping systems to a farm's production
(D) Exclusively cultivating high-value export-oriented crops across the entire extent of an agricultural holding

**132.** What is the most critical driving need for crop diversification in the western regions of Rajasthan?
(A) To fulfill growing domestic textile industrial demands for high-quality raw long-staple cotton fiber

Click Here to Buy book on Amazon

# ANSWERS

**1.** (B) 28 to 30 percent
The agriculture and allied sector plays a vital role in Rajasthan's economy, contributing approximately 28 to 30 percent to the Gross State Value Added at constant prices. This sector includes crop production, livestock, forestry, and fishing. Livestock represents a significant share within this sector, helping maintain stable economic growth across the arid and semi-arid regions.

**2.** (C) Statement I is correct but Statement II is incorrect.
Agriculture continues to employ the largest portion of India's total labor force, even though its overall share in national Gross Domestic Product has declined over time. However, gross capital formation as a proportion of agricultural GDP has historically hovered between 15% and 20%, falling well short of 40% due to persistent public and private investment constraints.

**3.** (C) Agro-based food processing
Gross Value Added calculation for agriculture and allied sectors encompasses four primary sub-components: crop husbandry, livestock rearing, forestry and logging, and fishing or aquaculture. Agro-based food processing operations involve post-harvest industrial manufacturing and mechanical transformation, which places them strictly under the secondary industrial manufacturing sector rather than primary agricultural sector accounting frameworks.

**4.** (A) I and II only
Agriculture maintains strong forward and backward linkages with the industrial sector by supplying key raw materials like cotton and sugarcane to manufacturing units while demanding industrial inputs like fertilizers and machinery. Far from draining reserves, agricultural exports generate substantial foreign exchange earnings for the economy, proving that agriculture serves as a positive contributor to national foreign exchange holdings.

**5.** (C) Net addition to fixed physical assets like irrigation networks, farm machinery, and storage structures
Gross Capital Formation in agriculture reflects the total net accumulation of durable physical capital assets within the agricultural sector during an accounting period. This includes long-term investments in irrigation infrastructure, land development, farm machinery, storage godowns, and livestock buildings. It excludes short-term operational expenses like seed purchases, fuel, or crop subsidies.

**6.** (B) P-2, Q-3, R-1, S-4
USDA soil taxonomy maps Aridisols to the arid western desert regions like Jaisalmer and Bikaner. Alfisols predominate in the fertile eastern plains around Jaipur and Bharatpur. Vertisols represent the clay-rich black soils characteristic of the southeastern Hadoti region. Inceptisols occur across the semi-arid to sub-humid transition zone covering Sirohi, Pali, and Rajsamand districts.

**7.** (D) Soybean and Cotton
The medium black soil prevalent in southeastern Rajasthan, particularly across Kota, Baran, Bundi, and Jhalawar, possesses high clay content and superior moisture retention capacity. These properties make it exceptionally suited for cultivating moisture-demanding commercial crops like soybean and cotton, whereas coarse cereals like pearl millet are adapted to dry, sandy soils.

**8.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Arid environmental conditions in western Rajasthan feature intense solar radiation, minimal precipitation, and high evapotranspiration rates. Water moving upward through soil pores via capillary action evaporates rapidly at the surface, leaving behind accumulated soluble salts like sodium chloride and sodium carbonate. This continuous process directly causes widespread soil salinity and alkalinity across western desert soils.

NODIA

of synthetic chemical fertilizers combined with total elimination of manure

(D) Cultivating agricultural crops exclusively within fully automated climate-controlled artificial indoor environments

www.nodia.in

Downloaded from www.pdf.tube

(B) To strictly comply with international trade standards and agricultural export quotas mandated by the WTO
(C) To effectively channel and utilize severe seasonal flash flooding produced during intense monsoon rains
(D) To reduce crop failure risks from erratic rain and save groundwater

**133.** Consider the following statements regarding crop diversification strategies in Rajasthan:
**Statement I:** The government encourages farmers to shift from high water-intensive crops like wheat to low water-requiring crops like mustard and gram during the Rabi season.
**Statement II:** Diversification into high-value horticultural crops and medicinal plants increases income resilience against climate shocks.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**134.** A farmer in Jalore faces frequent mild droughts and declining groundwater. Which of the following high-value, drought-resilient medicinal crops would be most suitable for diversification in this area?
(A) Commercial Sugarcane
(B) Isabgol
(C) Irrigated Paddy
(D) Commercial Jute

**135.** Which of the following is a primary morphological trait that plant breeders look for when developing drought-resistant crop varieties for arid regions?
(A) Broad, thin leaves with high surface area and dense open stomata
(B) Extremely shallow and horizontally spreading surface root systems
(C) Exceptionally high rates of continuous foliar transpirational water loss
(D) Deep root systems and reduced leaf surface area

**136.** Which institution in Rajasthan plays a leading role in developing and popularizing early-maturing and drought-escaping varieties of pearl millet (bajra) and moth bean?
(A) Central Arid Zone Research Institute (CAZRI)
(B) Indian Institute of Technology (IIT) Jodhpur
(C) Rajasthan State Pollution Control Board
(D) Malviya National Institute of Technology (MNIT)

**137.** Identify the correct statement regarding NICRA, an ICAR network project active in Rajasthan:
(A) It functions administratively under the full expansion title of National Institute of Crop Research and Analysis.
(B) It works strictly and exclusively on developing and field-testing transgenic genetically modified hybrid cotton.
(C) It aims to build climate resilience in Indian agriculture via research and demonstrations.
(D) It acts as an insurance provider offering 100% financial compensation for crop losses from natural disasters.

NODIA

**138.** 'HHB 67 Improved' is a widely adopted, early-maturing, downy mildew-resistant hybrid variety of which crop, highly suitable for the rainfed areas of Rajasthan?
(A) Pearl Millet
(B) Grain Maize crop
(C) Sorghum (Jowar fodder)
(D) Bread Wheat crop

**139.** In the context of climate-resilient agriculture, how does the practice of 'Zero Tillage' (No-Till farming) primarily help farmers in Rajasthan?
(A) It completely eliminates the agricultural necessity of applying synthetic chemical weedicides throughout the crop season.
(B) It dramatically increases surface soil albedo, thereby substantially cooling the localized microclimate around plant roots.
(C) It provides absolute structural guarantees for the permanent biological eradication of all harmful soil-borne pathogens.
(D) It conserves soil moisture, prevents erosion, and lowers fuel costs.

**140.** Which of the following is the most appropriate description of the core principles of Conservation Agriculture, a key strategy for climate resilience?
(A) Intensive deep continuous ploughing, open field burning of crop residues, and practicing strict crop monocropping
(B) Minimal soil tillage, permanent ground cover, and crop species diversification
(C) Complete operational reliance on high doses

**9.** (C) Laterite
Sierozem, Revrina, and Gypsiferrous represent specific traditional soil categories identified within Rajasthan's regional soil classification surveys, particularly across arid and semi-arid districts. Laterite soils develop under heavy tropical rainfall with intense leaching of silica. Since Rajasthan experiences low rainfall and arid conditions, true laterite soil formations are absent from traditional state soil mappings.

**10.** (A) They are formed by granite-gneiss weathering and are low in organic humus content.
Red-Yellow soils found in central and southern districts like Sawai Madhopur, Bhilwara, and Ajmer originate from the sub-aerial weathering of crystalline granite-gneiss rocks. These soils feature coarse to loamy textures with low organic matter, nitrogen, and humus levels. The red shade results from iron oxide diffusion, not dense surface calcium carbonate deposits.

**11.** (D) Western Sandy Plains
Entisols represent young, undeveloped soils that lack clear horizon development due to continuous wind erosion, deposition, or extreme dryness. In Rajasthan, Entisols dominate the vast Western Sandy Plains covering districts like Jaisalmer, Barmer, and Bikaner, where active sand dune movement prevents the structural soil profile maturation observed in humid or alluvial regions.

**12.** (B) October to November
In Rajasthan, Rabi crops are winter-season crops sown primarily between October and November following the retreat of the southwest monsoon. These crops mature during the cooler months and are harvested between March and April. Key examples of Rabi crops grown in the state include wheat, barley, gram, mustard, coriander, and cumin.

**13.** (B) III only
Zaid crops are short-duration summer crops grown primarily from March to June between the Rabi and Kharif seasons. These crops thrive under warm temperatures, long day length, and dry weather with reliable irrigation. Statement III is incorrect because cold weather causes severe frost injury, whereas crops like watermelon and cucumber require warm thermal conditions.

**14.** (D) Mustard — Rabi
Mustard is a primary oilseed crop grown during the Rabi winter season in Rajasthan, requiring cool temperatures during its growth and warm dry weather during harvest. In contrast, groundnut is a Kharif crop, gram or chickpea is grown in the Rabi season, and barley is cultivated as a Rabi cereal crop rather than a Zaid crop.

**15.** (A) II, I, IV, III
Systematic crop cultivation begins with soil preparation, which loosens topsoil and facilitates root aeration. Seed sowing follows proper soil bed preparation. Nutrients are then added through manure and fertilizers to support initial seedling growth. Irrigation is subsequently applied to maintain optimum moisture levels required for healthy crop emergence and continuous vegetative development throughout the season.

**16.** (B) Sorghum (Chari)
Sorghum, locally referred to as Chari, is extensively cultivated as a quick-growing Zaid fodder crop across Rajasthan during the summer months from April to June. It produces high yields of succulent green fodder that help sustain livestock health and milk production when natural pastures dry up before the arrival of the southwest monsoon.

**17.** (B) Linseed (Alsi)
Linseed, locally known as Alsi, is an oilseed crop cultivated exclusively during the Rabi winter season in Rajasthan. Pearl millet, maize, and green gram are traditional Kharif crops sown with the onset of the monsoon rains in June or July and harvested during autumn. Therefore, linseed stands out as a Rabi crop among Kharif options.

**18.** (A) First
Rajasthan holds the first rank in India for both total cultivated area and overall production of Pearl Millet, locally known as Bajra. The crop's exceptional resistance to severe heat, low water requirements, and adaptability to coarse sandy soils make it the dominant staple cereal crop across the state's dry western desert districts.

**19.** (A) Both Statement I and Statement II are correct.
Wheat requires a temperate climatic environment with cool temperatures during its early vegetative stage and bright, dry, warm sunshine during

Click Here to Buy book on Flipkart

**57.** (C) Relay cropping
Relay cropping is an intensive cropping system where seeds of a succeeding crop are sown into a standing crop before it reaches full harvest maturity. This overlapping strategy optimizes land use, utilizes residual soil moisture effectively, saves time between successive crop seasons, and increases overall annual cropping intensity per unit of agricultural land area.

**58.** (C) 750 mm
Dryland agriculture refers to growing crops without artificial irrigation in regions where annual precipitation is less than 750 millimeters. Farming in these low-rainfall areas relies entirely on stored soil moisture and rainfall conservation techniques. Crop choices focus on short-duration, deep-rooted, and drought-tolerant varieties capable of enduring erratic rainfall and prolonged dry spells.

**59.** (C) I, II, and IV only
Deep summer ploughing, mulching, and contour bunding are established moisture conservation and soil management practices used in dryland agriculture to maximize water infiltration, suppress evaporation, and control erosion. Statement III is incorrect because flood irrigation requires abundant water resources, making it unsuitable for moisture-starved dryland farming systems that rely on strict water conservation.

**60.** (B) To capture surface runoff, control soil erosion, and boost moisture
Contour bunding involves constructing earthen embankments along equal elevation contours across sloping field surfaces. These bunds break the velocity of overland surface runoff during heavy rain showers, reducing soil erosion and retaining water on the field. The held water infiltrates into the soil profile, increasing root-zone moisture availability essential for rainfed crops in dryland farming regions.

**61.** (C) Covering soil with organic or synthetic material to retain moisture and control weeds
Mulching is the practice of applying a protective layer of organic materials, such as straw or crop residues, or synthetic plastic sheets over the soil surface around plants. Mulch conserves soil moisture by suppressing evaporation, moderates soil temperature fluctuations, blocks sunlight to suppress weed growth, and eventually adds organic matter to topsoil upon decomposition.

**62.** (A) Both Statement I and Statement II are correct.
Anti-transpirants are chemical compounds applied to crop foliage to reduce moisture loss through stomatal transpiration without severely impairing carbon dioxide assimilation during dry spells. Reflectivating compounds, film-forming polymers, and stomatal-closing chemicals like potassium-based formulations or specialized waxes help crops maintain internal water balance and survive mid-season droughts in rainfed farming systems.

**63.** (A) Toba, Nadi, Talab
In traditional Rajasthani water harvesting, a Toba is the smallest and shallowest natural depression used for collecting rain runoff. A Nadi is a medium-sized rainwater pond constructed in rural villages to meet water needs for months. A Talab represents a much larger, deeper, structured water reservoir or lake capable of storing substantial water volumes over extended periods.

**64.** (B) P-2, Q-3, R-4, S-1
Horticulture is divided into specialized branches: Olericulture focuses on vegetable production; Pomology studies and cultivates fruit crops; Floriculture concentrates on ornamental flowers and landscape plants; and Viticulture deals specifically with grape cultivation and vineyard management. Matching these definitions yields the sequence P-2, Q-3, R-4, and S-1.

NODIA

**65.** (B) Arboriculture
Arboriculture is the specialized branch of horticulture focused on the cultivation, care, and management of individual trees, shrubs, vines, and woody perennial plants. Unlike silviculture, which manages forest stands for timber production, arboriculture focuses on individual plant health, structure, aesthetic appeal, and functional performance within urban landscapes, parks, and amenity gardens.

**66.** (A) Garden
The word "Horticulture" originates from two Latin roots: 'Hortus', meaning garden, and 'Cultura', meaning cultivation. Thus, horticulture literally translates to the art and science of garden crop cultivation, encompassing the production, processing, and management of fruits, vegetables, ornamental flowers, aromatic and medicinal plants, as well as plantation crops.

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

**29.** (C) Barley
Sugarcane, tobacco, and cotton are classified primarily as commercial cash crops, as they are grown chiefly for direct industrial sale and monetary return. Barley, on the other hand, is fundamentally classified as a cereal food crop used for human consumption, animal feed, and malt production, setting it apart from the purely industrial cash crops listed.

**30.** (C) 40% to 70%
Transitioning from traditional flood irrigation to drip systems delivers precise water applications directly to plant root zones, saving approximately 40 to 70 percent of water. Drip irrigation eliminates surface runoff, minimizes deep percolation losses, and reduces evaporation, proving essential for optimizing water use efficiency across water-scarce horticultural growing regions in Rajasthan.

**31.** (A) Applying water-soluble or liquid fertilizers through an irrigation system
Fertigation is the advanced agricultural practice of injecting water-soluble fertilizers, soil amendments, or liquid nutrients directly into an irrigation stream, typically via drip or micro-sprinkler systems. This method ensures precise nutrient delivery directly to the active root zone, significantly improving fertilizer use efficiency, reducing labor costs, and minimizing nutrient leaching losses into groundwater.

**32.** (B) It is ideal for crops like rice requiring standing water.
Sprinkler irrigation simulates natural rainfall overhead and is unsuited for standing water crops like paddy rice, which require continuous field submergence through basin flooding. Sprinklers excel in sandy soils with high intake rates, provide frost protection through latent heat release during freezing spells, and cover undulating topographies effectively without requiring extensive land leveling.

**33.** (B) Traditional water-lifting devices for irrigation
Chadas (a leather bucket pulled by bullocks), Rahat (the Persian wheel using a revolving chain of buckets), and Dhekli (a manually operated lever device) are traditional water-lifting mechanisms used across rural Rajasthan. Farmers historically constructed these indigenous devices near open wells and stepwells to raise groundwater for irrigating agricultural fields before modern electric pumps.

**34.** (B) I and III only
Drip irrigation delivers water directly to plant root zones, minimizing evaporation and percolation losses while allowing targeted fertigation. Statement II is incorrect because drip systems suppress weed growth between crop rows by keeping inter-row soil surfaces dry, unlike surface flooding methods that moisten the entire field surface and encourage rampant weed germination.

**35.** (C) Sprinkler irrigation
Sprinkler irrigation applies water overhead via pressurized pipe networks and spray nozzles, making it the most effective method for irrigating uneven or rolling topography without costly land grading. Furrow, border strip, and basin methods require level field surfaces to prevent water pooling and soil erosion, making sprinkler systems superior for hilly or undulating terrain.

**36.** (D) P-3, Q-4, R-1, S-2
The Indira Gandhi Canal Project renamed several lift canals to honor regional leaders: Bikaner-Lunkaransar became Kanwar Sen Lift Canal; Nohar-Sahawa was renamed Chaudhary Kumbharam Lift Canal; Phalodi Lift Canal became Guru Jambheshwar Lift Canal; and Gajner Lift Canal was renamed Panna Lal Barupal Lift Canal. Thus, option D represents the correct matching.

NODIA

**37.** (A) I, IV, II, III
Arranging the major lift canals of the Indira Gandhi Canal Project geographically from North to South yields: Chaudhary Kumbharam Lift Canal (serving Hanumanagrh/Churu), followed by Kanwar Sen Lift Canal (Bikaner), Dr. Karni Singh Lift Canal (Bikaner/Jodhpur), and Jai Narayan Vyas Lift Canal (Jodhpur/Jaisalmer) at the southern end. Thus, the correct order is I, IV, II, III.

**38.** (B) Harike Barrage
The Indira Gandhi Canal originates at the Harike Barrage in Punjab, constructed at the confluence of the Sutlej and Beas rivers. From Harike, the Rajasthan Feeder Canal transports water through Punjab and Haryana into Rajasthan, providing a crucial water source for domestic

grain ripening. Canal-irrigated northern districts like Sri Ganganagar and Hanumangarh provide these ideal growing conditions, making them leading wheat-producing districts in Rajasthan alongside other prominent eastern agricultural districts like Alwar and Bharatpur.

**20.** (A) I and II only
Jowar, or Sorghum, is widely known as the "camel crop" due to its outstanding ability to withstand prolonged dry spells and recover after rain. It is heavily cultivated across central and southeastern districts such as Ajmer, Tonk, and Bhilwara. Statement III is incorrect because Jowar serves as a vital dual-purpose crop providing both grain and green fodder.

**21.** (C) It is exceptionally drought-tolerant and well-adapted to dry, sandy soils.
Pearl Millet features an extensive root system and low transpiration loss, enabling it to thrive in arid climates receiving minimal annual rainfall. Western districts of Rajasthan possess dry sandy soils with low water-retention capacity where other major cereal crops struggle to survive, making pearl millet the most reliable staple crop for local rainfed agricultural systems.

**22.** (A) Sri Ganganagar, Hanumangarh, Alwar
Sri Ganganagar leads Rajasthan in wheat production due to extensive canal irrigation networks from the Indira Gandhi and Gang canals. Hanumangarh ranks second, utilizing canal waters, while Alwar ranks third among top producers due to fertile alluvial soils. Thus, the correct descending order of wheat production is Sri Ganganagar, followed by Hanumangarh, and then Alwar.

**23.** (D) Wheat
Raj 3077, Kalyan Sona, and Sonalika are prominent high-yielding semi-dwarf varieties of bread wheat cultivated extensively across irrigated tracts in Rajasthan. Developed to boost crop yields and disease resistance, these varieties offer high resistance to rust diseases and produce fine quality grains suitable for chapati making and commercial grain marketing across the region.

**24.** (A) P-4, Q-3, R-2, S-1
American Cotton is heavily produced in northern canal-irrigated districts like Sri Ganganagar and Hanumangarh. Isabgol is primarily grown in arid southwestern districts like Jalore and Barmer. Soybean dominates the southeastern Hadoti belt of Kota, Bundi, and Baran. Mustard is extensively cultivated in eastern alluvial districts like Alwar and Bharatpur, leading national production totals.

**25.** (C) Shale gas extraction via hydraulic fracturing
Guar gum, extracted from cluster bean seeds, possesses high viscosity and binding properties, making it an essential additive in hydraulic fracturing fluids used for commercial shale gas and oil extraction globally. Rajasthan produces the vast majority of India's total guar crop, exporting refined guar gum internationally to supply the energy, food processing, and pharmaceutical industries.

**26.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Eastern districts like Bharatpur and Alwar lead Rajasthan in mustard production because of their fertile alluvial loamy soils and favorable winter climate. Mustard thrives under mild winter temperatures and moderate moisture levels, which these districts reliably experience during the Rabi season, directly driving high crop yields and making the eastern plain the primary mustard belt.

**27.** (D) Gossypium hirsutum
Bikaneri Narma is an improved selection belonging to the American cotton species Gossypium hirsutum. Cultivated under irrigated conditions in northern Rajasthan, particularly in Sri Ganganagar, Hanumangarh, and Bikaner districts, this medium-to-long staple cotton variety offers higher yield potential and superior fiber quality compared to traditional indigenous short-staple Asiatic cotton varieties.

**28.** (B) I and III only
Rajasthan leads India in mustard production, benefiting from favorable winter growing conditions. Mustard is a Rabi crop requiring cool weather during growth and dry sunny weather at maturity. Severe frost during flowering causes significant yield loss. Statements II and IV are false because mustard is a cool-season Rabi crop rather than a high-rainfall Kharif crop.

Downloaded from www.pdf.tube

southern Rajasthan, the district achieved this landmark status by systematically phasing out synthetic chemical fertilizers and pesticides, promoting vermicomposting, encouraging bio-fertilizers, and implementing large-scale organic cluster cultivation programs under state and central sustainable agricultural schemes to protect environmental health.

**49.** (B) To maintain long-term soil health using natural inputs rather than synthetic chemicals
Organic farming is a holistic production management system designed to enhance soil ecological health, biodiversity, and biological cycles. It avoids synthetic inputs like chemical fertilizers, pesticides, and genetically modified organisms. Instead, it relies on crop rotation, green manures, compost, and biological pest controls to sustain long-term soil fertility and produce safe, ecologically sustainable food crops.

**50.** (A) I and II only
The International Federation of Organic Agriculture Movements defines four foundational principles of organic farming: Health, Ecology, Fairness, and Care. These principles emphasize sustaining soil, ecosystem, and human health through natural ecological processes. Chemical Augmentation contradicts these principles, as organic systems strictly prohibit synthetic chemical inputs, making Statement III incorrect in the context of organic agriculture.

**51.** (C) Vermicomposting
Vermicomposting is the process of using specialized earthworm species, such as Eisenia fetida, to break down organic waste materials into nutrient-rich organic compost. Earthworms ingest organic matter, accelerating decomposition and enriching the final product with plant-available nutrients, beneficial microbial flora, and growth hormones, producing superior organic fertilizer for agricultural and horticultural soil enrichment.

**52.** (D) Phorate
Phorate is a highly toxic synthetic organophosphate chemical insecticide strictly prohibited in certified organic farming standards. Organic agriculture permits natural and biological inputs such as de-oiled neem cake, microbial biofertilizer cultures like Rhizobium, and composted Farm Yard Manure, but excludes synthetic chemical pesticides to protect ecosystem health and maintain natural product integrity.

NODIA

**53.** (C) Combining crop cultivation with livestock rearing
Mixed Farming is an integrated agricultural system where crop cultivation is combined with livestock rearing on the same farm holding. The two components support each other: crop residues and fodder feed livestock, while animal manure enriches soil fertility for crop growth. This integrated approach diversifies farmer income streams and reduces overall farm financial risks.

**54.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Including leguminous crops in crop rotation cycles improves soil fertility because legumes form symbiotic relationships with Rhizobium bacteria housed within their root nodules. These bacteria convert atmospheric nitrogen into plant-usable nitrate forms, naturally enriching soil nitrogen levels. This biological nitrogen fixation reduces the need for synthetic nitrogen fertilizers, making legumes essential for sustainable cropping systems.

**55.** (D) Moong bean
Moong bean is a short-duration leguminous pulse crop capable of fixing atmospheric nitrogen through root nodule symbiosis. Cultivating moong bean following nitrogen-exhaustive cereal crops like bajra replenishes soil nitrogen, restores biological activity, and improves soil physical structure. Cereal crops like wheat, maize, or sorghum would deplete remaining soil nutrients further rather than restoring fertility naturally.

**56.** (A) Harvesting and threshing of individual crops are much easier in mixed cropping compared to intercropping.
Statement A is incorrect because harvesting and separating individual crops in mixed cropping is difficult, as seeds are mixed and sown randomly without row arrangement. Intercropping grows distinct crops in structured, separate row arrangements, making targeted harvesting, weeding, spraying, and mechanical threshing far easier and more efficient than in randomly mixed crop stands.

do not guarantee complete immunity from soil-borne pathogens; operators must still apply proper soil sterilization, solarization, or soilless substrate management to maintain disease-free crop roots.

**77.** (C) A framed structure covered with woven nets to shade crops from intense heat and radiation
A Shade Net House is a protected cultivation structure built using metal or bamboo frames covered with woven synthetic shading nets. These nets diffuse direct solar radiation, lower canopy temperatures, reduce transpiration rates, and shield crops against wind and severe heat. They are widely used in dry, hot regions to raise high-quality vegetables, nursery plants, and flowers.

**78.** (D) High-value exotic vegetables and cut flowers
Controlled greenhouse cultivation involves significant capital investment and operational costs, making it most economically viable for high-value horticultural crops. Cultivating crops like colored capsicums, seedless cucumbers, cherry tomatoes, orchids, and Dutch roses yields high market prices year-round, generating sufficient revenue to justify the high infrastructure and maintenance expenses of greenhouse facilities.

**79.** (A) It requires continuous electricity to power automated fans and wet cooling pads.
Statement A describes a fan-and-pad climate-controlled greenhouse rather than a naturally ventilated polyhouse. Naturally ventilated polyhouses rely on thermal buoyancy and wind pressure through manually or automatically operated side and roof vents to regulate temperature and humidity, making them far less electricity-dependent, lower in operational cost, and highly suitable for moderate climates.

**80.** (A) Both Statement I and Statement II are correct.
Elevating ambient Carbon Dioxide levels inside greenhouses accelerates photosynthesis and crop growth, as atmospheric carbon limits plant carbon fixation under high light conditions. However, this growth acceleration only occurs when other vital environmental inputs, including photosynthetic light intensity, root moisture, and balanced mineral nutrients, are supplied in optimal amounts without becoming limiting factors.

**81.** (B) 10
For agricultural planning, research, and resource optimization, Rajasthan is divided into 10 distinct Agro-Climatic Zones based on parameters like rainfall, temperature, soil types, water availability, and cropping patterns. These range from Zone I a (Arid Western Plain) in the dry west to Zone V (Humid South-Eastern Plain) in the fertile Hadoti region.

**82.** (A) P-1, Q-2, R-3, S-4
The official classification maps Zone I a as the Arid Western Plain covering Jodhpur and Barmer; Zone II b as the Transitional Plain of Luni Basin including Jalore and Pali; Zone III a as the Semi-Arid Eastern Plain encompassing Jaipur and Ajmer; and Zone V as the Humid South-Eastern Plain comprising Kota and Jhalawar.

**83.** (C) Zone I c (Hyper Arid Partial Irrigated Zone)
Zone I c, designated as the Hyper Arid Partial Irrigated Zone, is the largest agro-climatic zone in Rajasthan by land area. Covering vast expanses of Jaisalmer, Bikaner, and parts of Sri Ganganagar, this expansive zone is characterized by extreme aridity, sparse vegetation, sand dunes, low rainfall, and emerging canal irrigation from the Indira Gandhi Canal.

**84.** (D) It encompasses Banswara, Dungarpur, and Pratapgarh districts with significant tribal agriculture.
Agro-climatic Zone IV b, designated as the Humid Southern Plain of Rajasthan, encompasses the southern districts of Banswara, Dungarpur, and Pratapgarh along with parts of Udaipur. This zone receives higher annual rainfall compared to western zones, features undulating topography with reddish-loamy soils, and is home to a predominantly tribal farming population practicing traditional agriculture.

**85.** (C) Jaisalmer
Zone V, designated as the Humid South-Eastern Plain, comprises the Hadoti region districts including Kota, Bundi, Baran, and Jhalawar. This region features deep black soils and high annual rainfall. Jaisalmer lies in the far western desert region and belongs to Zone I c (Hyper Arid Partial Irrigated Zone), making it completely distinct from Zone V.

Click Here to Buy book on Amazon

**67.** (C) Rubber
Rubber is classified as a industrial plantation crop grown on commercial estates primarily for latex extraction. Mango, guava, and pomegranate are classified as horticultural fruit crops grown in orchards for fresh fruit consumption or food processing. Rubber differs in economic classification, growth requirements, processing methods, and product utilization from standard horticultural fruit crops.

**68.** (D) Extending shelf life and adding value to produce through proper handling, processing, and packaging
Post-Harvest Technology in horticulture encompasses all technical operations conducted from the point of crop harvest through to final consumption. It includes sorting, grading, washing, pre-cooling, chemical treatments, cold storage, protective packaging, and value-added food processing. Its primary objective is to minimize post-harvest quantitative and qualitative spoilage losses while extending commodity shelf life.

**69.** (C) Sri Ganganagar
Sri Ganganagar leads Rajasthan in the commercial production of Kinnow, a high-yielding mandarin citrus hybrid. The district's canal irrigation systems, sandy loam soils, bright sunshine, and favorable winter thermal regime provide ideal growing conditions. Kinnow produced in Sri Ganganagar is renowned nationally for its rich juice content, high yields, and superior fruit quality.

**70.** (B) Jalore and Barmer
Jalore and Barmer districts are the primary producers of Isabgol, or Psyllium husk, in Rajasthan, giving the state a near monopoly in national production. The crop thrives in the light, well-drained sandy soils and dry, cool winter climate of southwestern Rajasthan, producing high seed husk quality valued across domestic and international pharmaceutical markets.

**71.** (A) I and II only
Pushkar in Ajmer and Khamnore in Rajsamand are celebrated centers for commercial Damask rose cultivation, producing rose oil, gulkand, and rose water. Statement III is incorrect because rose plants are high-value perennial horticultural crops that require well-managed, regular irrigation systems throughout their growth and flowering cycles, making rainfed production non-viable for commercial cultivation.

**72.** (A) Apple — Jaisalmer
Apples are temperate fruit crops requiring significant winter chilling hours and temperate climates, making commercial apple cultivation impossible in the hot, arid desert environment of Jaisalmer. Citrus oranges flourish in humid Jhalawar, high-quality pomegranates thrive in arid Barmer and Jalore, and custard apples grow in sub-humid Rajsamand and Chittorgarh districts.

**73.** (C) Cumin and coriander
Rajasthan leads Indian states in the production of seed spices, holding a dominant national market share in cumin and coriander. Cumin flourishes in dry western districts like Jalore, Barmer, and Jodhpur, while coriander is grown extensively in southeastern districts like Kota, Baran, and Jhalawar due to favorable soil and climate conditions.

**74.** (A) II, III, I, IV
The correct post-harvest horticultural supply chain sequence begins with harvesting fruits at optimal maturity. Fruits are immediately pre-cooled to eliminate field heat and slow down respiration. Next, produce undergoes systematic grading and sorting based on size, color, and quality standards. Finally, sorted fruits are packed in protective containers and transported to market destinations.

**75.** (D) It lets in short-wave sunlight while trapping long-wave thermal radiation, raising internal warmth.
Greenhouses utilize transparent covering materials like glass or polyethylene that allow short-wave solar radiation to pass inside. This radiation heats the internal plants and soil, which then re-emit energy as long-wave thermal infrared radiation. The cladding traps this long-wave radiation, creating a warmer internal microclimate that protects crops from cold winter temperatures outside.

**76.** (A) I, II, and III only
Polyhouse farming enables off-season crop production, shields plants against destructive weather events like hail or frost, and reduces water loss through reduced evaporation. Statement IV is incorrect because polyhouses

NODIA

supply, livestock, and agricultural irrigation across the northwestern desert districts.

**39.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Intensive canal irrigation in the Indira Gandhi Canal area, coupled with low permeability and shallow hardpan layers, has caused water tables to rise rapidly. This upward movement brings dissolved salts to topsoil layers upon evaporation, creating widespread waterlogging and salinity locally termed 'Sem'. Thus, excessive unmanaged canal water application directly drives this severe ecological issue.

**40.** (A) Jhalawar
Jhalawar is situated in the far southeastern Hadoti region of Rajasthan and falls under the Chambal river basin, receiving abundant rainfall and river irrigation. The Indira Gandhi Canal Project exclusively serves northwestern and western desert districts including Bikaner, Churu, Jodhpur, Sri Ganganagar, Hanumangarh, Jaisalmer, and Barmer, making Jhalawar completely outside its command area.

**41.** (A) 204 km
The Rajasthan Feeder Canal covers a total length of 204 kilometers from its origin at Harike Barrage to Masitawali Head in Hanumangarh district, Rajasthan. Out of this total feeder distance, 170 kilometers lie within the states of Punjab and Haryana, while the remaining 34 kilometers run inside the boundary of Rajasthan before feeding the main canal system.

**42.** (A) Green plants ploughed into the soil to improve organic fertility
Green manure refers to leguminous or fast-growing crops, such as Sunn hemp, Dhaincha, or Cowpea, grown specifically to be ploughed directly back into the field while still succulent. Incorporating these green plants into topsoil improves organic matter, fixes atmospheric nitrogen, enhances soil structure, boosts biological microbial activity, and increases overall soil fertility naturally.

**43.** (B) I, III, and IV only
Organic manures are bulky with low nutrient density per unit weight, releasing nutrients slowly over time while improving soil physical structure and moisture retention. Continuous chemical fertilizer misuse degrades soil health. Statement II is incorrect because chemical fertilizers deliver concentrated plant nutrients but do not add organic matter or improve soil physical structure like organic manure does.

**44.** (C) 46%
Standard agricultural grade Urea contains 46 percent Nitrogen by weight, making it the most concentrated solid nitrogenous chemical fertilizer available in the commercial market. Widely utilized across crop production systems, Urea supplies plants with readily available amide nitrogen, which soil microbes convert into ammonium and nitrate forms for rapid plant uptake during vegetative growth phases.

**45.** (C) Statement I is correct but Statement II is incorrect.
The standard recommended ratio for Nitrogen, Phosphorus, and Potassium application in cereal production is 4:2:1. Statement II is incorrect because Indian farmers, including those in Rajasthan, typically overapply inexpensive Nitrogen through Urea while underapplying Potassium and Phosphorus, creating unbalanced soil nutrient profiles that hinder optimal long-term soil health and crop yields.

**46.** (D) Diammonium Phosphate (DAP) — Potassium
Diammonium Phosphate, commonly known as DAP, is a primary complex fertilizer containing 18% Nitrogen and 46% Phosphorus by weight, but it contains zero Potassium. Muriate of Potash provides Potassium, Single Super Phosphate supplies Phosphorus, and Calcium Ammonium Nitrate supplies Nitrogen, making the DAP-Potassium pairing incorrect as DAP contains no potassium component.

**47.** (A) Diammonium Phosphate (DAP)
Diammonium Phosphate is the most suitable basal fertilizer for wheat sowing because it supplies both Nitrogen (18%) and Phosphorus (46%) in water-soluble forms right at the seedbed. Phosphorus promotes early root development and seedling establishment, while initial Nitrogen supports early vegetative shoot growth, making DAP an ideal combined nutrient source during crop planting.

**48.** (B) Dungarpur
Dungarpur was officially declared as Rajasthan's first fully organic farming district. Located in

Downloaded from www.pdf.tube

**86.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Zone I a features dry sandy soils and low, erratic rainfall, favoring drought-hardy crops like bajra, moth bean, and guar. Conversely, Zone IV a receives moderate rainfall and possesses loamy soils with high water retention, allowing farmers to cultivate maize in Kharif and wheat in Rabi. Differences in rainfall and soil characteristics directly dictate these distinct cropping patterns.

**87.** (D) Legumes
Rhizobium bacteria establish species-specific symbiotic associations with the roots of leguminous plants, such as chickpea, moong, soybean, and groundnut. The host plant forms root nodules that house the bacteria, which fix atmospheric nitrogen into plant-available ammonium forms. In return, the plant supplies carbohydrates and structural protection to the bacterial symbionts.

**88.** (A) Biopesticides
Trichoderma viride is a beneficial bio-fungicidal fungus used to manage soil-borne plant pathogens, while Bacillus thuringiensis (Bt) is a soil bacterium that produces crystal proteins toxic to specific insect pests like caterpillars. Both biological organisms serve as eco-friendly biopesticides in integrated pest management strategies, reducing dependency on synthetic chemical pesticides in crop production.

**89.** (C) Azotobacter
Azotobacter is a free-living, non-symbiotic nitrogen-fixing bacterium recommended for non-leguminous crops like wheat, barley, maize, and mustard. When applied to seeds or soil, Azotobacter colonizes the rhizosphere, converting atmospheric nitrogen into plant-usable forms while secreting growth-promoting substances that enhance root development and crop yield without requiring symbiotic nodule formation.

**90.** (B) I and III only
Biofertilizers contain living beneficial microorganisms that enhance nutrient availability, fix nitrogen, solubilize phosphorus, and improve long-term soil biological health sustainably. Statement II is incorrect because biofertilizers enrich soil nutrient supplies but do not replace the plant's physiological need for water; crop production still requires adequate rainfall or irrigation to support plant growth and nutrient transport.

**91.** (D) Endosulfan
Endosulfan is a synthetic organochlorine chemical insecticide and acaricide, not a biofertilizer. Azospirillum (nitrogen-fixing bacterium), Mycorrhiza (vesicular-arbuscular fungal symbiont), and Azolla (nitrogen-fixing aquatic fern host) are biological organisms that fix atmospheric nitrogen or solubilize soil nutrients, making them true biofertilizers used in sustainable agriculture.

**92.** (A) Both Statement I and Statement II are correct.
Mycorrhiza forms a beneficial symbiotic association between soil fungi and plant roots. The fungal hyphae extend far into the soil matrix beyond the root depletion zone, effectively expanding the root surface area. This enhanced network increases the plant's capacity to absorb water and immobile soil nutrients, particularly phosphorus, improving overall crop growth and drought resilience.

NODIA

**93.** (C) Suratgarh
The nationwide Soil Health Card Scheme was officially launched by the Prime Minister on February 19, 2015, from Suratgarh in Sri Ganganagar district, Rajasthan. The flagship scheme was designed to evaluate soil nutrient status systematically across farming holdings in India, promoting balanced fertilizer application and preventing soil degradation through custom nutrient management recommendations.

**94.** (D) Swasth Dhara, Khet Hara
The official motto of the Soil Health Card Scheme is "Swasth Dhara, Khet Hara", which translates to "Healthy Land, Green Farm". This slogan underscores the core objective of maintaining healthy, nutrient-balanced soils through scientific testing and targeted fertilizer applications, which in turn leads to higher crop productivity and vibrant, sustainable agricultural fields nationwide.

**95.** (D) I, II, III, and IV
A standard Soil Health Card evaluates 12 critical parameters: primary macronutrients (Nitrogen, Phosphorus, Potassium), secondary nutrients (Sulphur), micronutrients (Zinc, Iron, Copper, Manganese, Boron), and physical-chemical

indicators (pH, Electrical Conductivity, and Organic Carbon). Assessing these parameters together yields comprehensive diagnostic data used to issue tailored fertilizer recommendations to farmers.

**96.** (B) To assess soil nutrient levels and recommend crop-specific fertilizer doses
The primary objective of issuing a Soil Health Card is to provide farmers with a customized diagnostic report detailing the exact nutrient status of their agricultural soils. Based on these lab results, the card recommends precise, crop-specific balanced dosages of chemical fertilizers and organic amendments, preventing over-fertilization, lowering production costs, and preserving long-term soil health.

**97.** (B) Every 2 years
Under the guidelines of the Soil Health Card Scheme, soil samples are tested and Soil Health Cards are renewed every two years for each land holding. This biennial cycle allows farmers to track changing soil nutrient levels over successive crop rotations, adjust fertilizer applications accordingly, and maintain optimal soil fertility over time.

**98.** (A) To compensate farmers and farm workers for death or disability during farm work
The Mukhyamantri Krishak Sathi Yojana in Rajasthan provides financial assistance and social security compensation to farmers, agricultural laborers, and their families in the event of accidental death or permanent disability occurring while operating farm machinery, handling pesticides, or performing agricultural field duties, helping alleviate financial distress caused by agricultural accidents.

**99.** (C) Agricultural Marketing Board (Mandi Samitis)
The Rajeev Gandhi Krishak Sathi Sahayata Yojana is implemented through the Rajasthan State Agricultural Marketing Board via local Agricultural Produce Market Committees (Mandi Samitis). Mandi Samitis collect agricultural market fees and administer financial relief payments directly to eligible farmers and agricultural laborers who suffer accidental injuries or death during agricultural and marketing operations.

**100.** (A) Both Statement I and Statement II are correct.
The Rajasthan Agricultural Competitiveness Project (RACP) aims to enhance agricultural productivity, improve water-use efficiency, and build climate resilience for smallholder farmers across selected clusters in the state. The project is an externally aided development initiative financially supported by the World Bank, integrating sustainable land, water, and agricultural management practices across targeted regions.

**101.** (C) Transferring universal basic income to all rural families
Rashtriya Krishi Vikas Yojana (RKVY) focuses on incentivizing public investment in agriculture, granting states operational flexibility to design tailored agricultural development plans, and strengthening post-harvest infrastructure and farm mechanization. Transferring universal basic income is not a component of RKVY; direct income support is instead handled by targeted welfare programs like PM-KISAN.

**102.** (B) To protect standing crops from wild boars and stray animals
Under the Tarbandi (wire fencing) component of the Mukhyamantri Krishak Sathi Yojana, the Rajasthan government offers financial subsidies to farmers for erecting barbed wire perimeter fencing around their farmland. This fencing protects standing crops from damage caused by stray cattle, wild boars, and undomesticated animals, significantly reducing crop losses across vulnerable agricultural areas.

**103.** (A) Rashtriya Krishi Vikas Yojana (RKVY), Soil Health Card Scheme, PM KISAN Samman Nidhi
Rashtriya Krishi Vikas Yojana (RKVY) was launched in 2007 to boost agricultural public investment. The Soil Health Card Scheme was launched in 2015 to promote balanced soil nutrition. PM-KISAN Samman Nidhi was introduced in 2019 to provide direct income support to farming households. Therefore, option A represents the correct chronological sequence.

**104.** (B) 2.0% of the sum insured
Under the Pradhan Mantri Fasal Bima Yojana (PMFBY), the premium rate payable by farmers is capped at a maximum of 2.0 percent of the total sum insured for all Kharif food and oilseed

Click Here to Buy book on Flipkart

crops. The remaining portion of the actuarial premium is shared equally between the Central and State Governments as an insurance subsidy.

**105.** (D) Assertion (A) is false but Reason (R) is true.
Assertion A is false because PMFBY does not assess all crop yield losses strictly at the individual farm level. Instead, the scheme predominantly employs an "Area Approach" using defined insurance units like Village Panchayats for widespread natural calamities, while reserving individual farm-level assessments specifically for localized risks like hailstorms, landslides, and inundation.

**106.** (A) The scheme is currently mandatory for all farmers availing seasonal agricultural operations (SAO) crop loans.
Statement A is incorrect because the Central Government revised PMFBY guidelines in 2020, making crop insurance enrolment entirely voluntary for all farmers, including those borrowing seasonal agricultural operation loans. The scheme covers post-harvest unseasonal rain damages for up to 14 days, covers prevented sowing risks, and caps annual commercial crop premiums for farmers at 5%.

**107.** (A) ₹1,500
Under PMFBY guidelines, the maximum premium rate payable by farmers for Rabi food grains and oilseed crops is capped at 1.5% of the sum insured. For a Rabi wheat crop with a total sum insured of ₹1,00,000, the maximum out-of-pocket premium payment required from the farmer is 1.5% of ₹1,00,000, which equals ₹1,500.

**108.** (C) 31st July
The standard cut-off date for farmer enrolment and crop insurance coverage application for Kharif season crops under PMFBY in Rajasthan is typically July 31st each year. Farmers must complete their insurance applications and premium submissions through banks, CSC centers, or the national portal on or before this date to secure coverage for the season.

**109.** (C) Commission for Agricultural Costs and Prices (CACP)
The Commission for Agricultural Costs and Prices (CACP) is the specialized expert body attached to the Ministry of Agriculture and Farmers Welfare that recommends Minimum Support Prices (MSPs) for mandated agricultural commodities. CACP analyzes parameters like production costs, market price trends, input price changes, demand-supply balances, and parity between crop prices when formulating its recommendations.

**110.** (D) Electronic National Agriculture Market
e-NAM stands for Electronic National Agriculture Market. It is a pan-India electronic trading portal launched by the Central Government that integrates existing APMC mandis into a unified national market for agricultural commodities. The platform facilitates online bidding, transparent price discovery, digital payments, and streamlined commodity marketing for farmers and traders across participating mandis nationwide.

**111.** (A) It develops and maintains mandi yards, rural link roads, and farmer rest houses.
The primary function of the Rajasthan State Agricultural Marketing Board (RSAMB) is to establish, develop, and modernize agricultural market yards (mandis) across the state. RSAMB constructs essential rural infrastructure including market platforms, link roads connecting farms to mandis, farmer rest houses, cold storage facilities, and grading facilities to facilitate agricultural trade.

**112.** (B) Sugarcane
The Government of India announces a Fair and Remunerative Price (FRP) specifically for sugarcane under the Sugarcane (Control) Order. Sugar mills are legally obligated to pay this minimum statutory price to sugarcane growers for cane deliveries. For other major agricultural crops like raw cotton, jute, and food grains, the government announces Minimum Support Prices instead.

**113.** (B) 22
The Government of India officially fixes Minimum Support Prices (MSPs) for 22 mandated agricultural crops based on CACP recommendations. These encompass 14 Kharif crops (including paddy, maize, and cotton), 6 Rabi crops (including wheat, barley, and mustard), and 2 other commercial crops (raw jute and copra). Sugarcane pricing is governed separately by its Fair and Remunerative Price.

Downloaded from www.pdf.tube

(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**26.** Under the Joint Forest Management (JFM) framework in Rajasthan, what is the primary local institution created at the village level to implement the programme?
(A) Village Forest Protection and Management Committee (VFPMC)
(B) Zila Parishad Forest Conservation and Environmental Development Cell
(C) Gram Sabha Land Acquisition and Natural Resource Management Board
(D) Block Level Forestry Cooperative and Rural Welfare Association

**27.** Given below are two statements regarding Joint Forest Management (JFM):
**Statement I:** Under JFM, participating local communities are granted full ownership rights over the forest land they protect.
**Statement II:** Local communities under JFM are entitled to a share in the non-timber forest produce and a portion of the timber revenue upon harvesting.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**28.** Which landmark national policy laid the foundational principle for Joint Forest Management by emphasizing that forests cannot be protected without the willing support of local communities?
(A) Indian Forest Act, 1927
(B) National Forest Policy, 1988
(C) Wildlife (Protection) Act, 1972
(D) Biological Diversity Act, 2002

**29.** The Aravalli Afforestation Project (1992-2000), a major scheme aimed at checking desertification and restoring ecological balance in Rajasthan, was funded by which international organization?
(A) Overseas Economic Cooperation Fund (OECF), Japan
(B) International Bank for Reconstruction and Development (World Bank)
(C) Global Environment Facility (GEF) Trust Fund
(D) United Nations Environment Programme (UNEP) Finance Division

**30.** Consider the following statements regarding the Rajasthan Forestry and Biodiversity Project (RFBP):
I. It aims to enhance forest cover and conserve biodiversity.
II. Livelihood improvement of forest-dependent communities is one of its core components.
III. It is solely funded by the State Government of Rajasthan without external assistance.
IV. It involves activities like afforestation, soil and water conservation, and eco-tourism development.
Which of the above statement(s) is/are incorrect?
(A) Only I and II
(B) Only III
(C) Only II and IV
(D) I, III and IV

**31.** What is the primary objective of the 'Maru Gochar Yojana' implemented in Rajasthan?
(A) To provide heavily subsidized solar irrigation pumping systems to small farmers in western desert areas
(B) To promote commercial dairy processing and milk distribution units across major urban municipal areas
(C) To eradicate invasive alien plant species completely from designated state national parks and reserves
(D) To rejuvenate degraded pasture lands and ensure fodder supply in arid areas

**32.** Which of the following pairs of afforestation-related schemes and their primary focus area is correctly matched?
(A) Rukha Bhaila Programme — Promotion of intensive chemical fertilizer application in state forestry
(B) Van Dhan Yojana — Constructing large multipurpose concrete dams for agricultural irrigation networks
(C) Smriti Van Yojana — Developing green spaces in memory of departed loved ones
(D) Nagar Van Yojana — Promoting traditional shifting cultivation practices in remote tribal forest areas

NODIA

**123.** (D) Narmada Canal Project
The Narmada Canal Project in Rajasthan was the first major irrigation project in India to mandate sprinkler irrigation across its entire command area. By making pressurized sprinkler systems compulsory for farmers receiving canal water in Jalore and Barmer districts, the project dramatically increased irrigation efficiency, expanded irrigated land coverage, and prevented traditional flood irrigation water waste.

**124.** (C) Statement I is correct but Statement II is incorrect.
Sub-surface drip irrigation involves placing lateral drip lines below the soil surface directly within the active root zone. Statement II is incorrect because burying the drippers below the surface significantly reduces soil surface evaporation compared to surface drip systems, while keeping the topsoil dry, suppressing weed seed germination, and preventing physical damage to lateral tubing.

**125.** (C) Jodhpur
The Central Arid Zone Research Institute (CAZRI) is located in Jodhpur, Rajasthan. Established in 1959 under the Indian Council of Agricultural Research (ICAR), CAZRI is a premier national research institute dedicated to conducting multidisciplinary research on sand dune stabilization, dryland crop management, soil-water conservation, and sustainable natural resource management in arid and semi-arid ecosystems.

**126.** (D) Bikaner
Swami Keshwanand Rajasthan Agricultural University (SKRAU) is situated in Bikaner. Established in 1987 as the state's first dedicated agricultural university, SKRAU conducts agricultural research, offers higher education programs, and leads extension services tailored specifically to farming challenges in the hyper-arid and canal-irrigated northwestern regions of Rajasthan.

**127.** (A) National Research Centre on Seed Spices — Tabiji (Ajmer)
Option A is correctly matched: the ICAR-National Research Centre on Seed Spices is located at Tabiji in Ajmer. Options B, C, and D are mismatched because the Directorate of Rapeseed-Mustard Research is at Sewar (Bharatpur), the Central Institute for Arid Horticulture is at Beechwal (Bikaner), and the Arid Forest Research Institute is in Jodhpur.

**128.** (B) Southern and South-Eastern Rajasthan (Mewar region)
Maharana Pratap University of Agriculture and Technology (MPUAT) is located in Udaipur and caters to the agricultural research, educational, and extension needs of southern and southeastern Rajasthan. Its jurisdiction covers the Mewar region, focusing on sub-humid tropical cropping systems, tribal agricultural development, maize research, horticultural crops, integrated farming, and soil-water management in undulating topographies.

**129.** (B) Jai Narain Vyas University, Jodhpur
Jai Narain Vyas University in Jodhpur is a general state university offering liberal arts, commerce, law, and basic sciences, rather than a specialized State Agricultural University. Agriculture University Kota, Agriculture University Jodhpur, and Sri Karan Narendra Agriculture University in Jobner are dedicated agricultural universities established to spearhead agricultural education, research, and farm extension statewide.

**130.** (A) Jodhpur
The Arid Forest Research Institute (AFRI) is located in Jodhpur, Rajasthan. Operating under the Indian Council of Forestry Research and Education (ICFRE), AFRI conducts forestry research aimed at conserving biodiversity, developing eco-friendly desert afforestation techniques, arresting desertification, and promoting agroforestry models suitable for the hot arid and semi-arid regions of Rajasthan and Gujarat.

**131.** (C) Adding new crops or cropping systems to a farm's production
Crop Diversification refers to shifting from traditional monoculture cropping toward growing a wider variety of crops or adopting multi-crop production systems on a farm. By incorporating pulses, oilseeds, spices, or horticultural crops alongside traditional cereals, farmers reduce market and climatic risks, improve soil nutrient health, optimize water use, and establish stable, year-round farm income streams.

Click Here to Buy book on Amazon

**132.** (D) To reduce crop failure risks from erratic rain and save groundwater
In western Rajasthan, crop diversification is vital to address hyper-arid conditions, low water availability, and declining groundwater tables. Shifting from high water-consuming cereals to drought-resilient, low water-requiring crops like pulses, cluster bean, seed spices, and oilseeds minimizes risk of total crop failure during droughts while conserving limited groundwater reserves for sustainable long-term farm operations.

**133.** (A) Both Statement I and Statement II are correct.
The government encourages farmers to diversify during the Rabi season by replacing water-intensive crops like wheat with low-water crops like mustard and gram. Diversifying into high-value horticultural crops and medicinal plants builds economic resilience against climate shocks, enhances water efficiency, and diversifies farm income streams across vulnerability-prone agricultural zones in Rajasthan.

**134.** (B) Isabgol
Isabgol is a high-value, drought-resilient medicinal crop ideally suited for diversification in dry regions like Jalore with declining groundwater levels. It requires minimal irrigation, thrives in well-drained light soils, tolerates moderate dry spells, and yields lucrative commercial market returns, making it far superior to high water-demanding crops like sugarcane, paddy, or commercial jute in arid environments.

**135.** (D) Deep root systems and reduced leaf surface area
Plant breeders developing drought-resistant crop varieties for arid regions target traits like deep, extensive root systems that reach subsoil moisture stores, alongside reduced leaf surface area, thick cuticles, or waxy coatings. These morphological adaptations help crops extract deeper soil moisture efficiently while minimizing transpirational water loss, allowing plants to survive prolonged dry spells in dryland environments.

**136.** (A) Central Arid Zone Research Institute (CAZRI)
The Central Arid Zone Research Institute (CAZRI) in Jodhpur plays a leading national role in breeding, evaluating, and promoting early-maturing, drought-escaping, and stress-tolerant crop varieties of pearl millet, moth bean, and cluster bean. These improved varieties enable rainfed crops in arid Rajasthan to complete their life cycles before soil moisture reserves deplete during brief monsoons.

**137.** (C) It aims to build climate resilience in Indian agriculture via research and demonstrations.
National Innovations in Climate Resilient Agriculture (NICRA) is an ICAR network project launched to enhance the resilience of Indian agriculture to climate vulnerability through strategic research and technology demonstrations. Active across vulnerable districts in Rajasthan, NICRA field-tests stress-tolerant crop varieties, natural resource management techniques, custom hiring centers, and climate-smart farm practices to safeguard rural livelihoods against climate change.

**138.** (A) Pearl Millet
'HHB 67 Improved' is a celebrated, early-maturing, high-yielding hybrid variety of Pearl Millet (Bajra). Resistant to downy mildew disease, it matures within 60 to 65 days, making it ideal for rainfed regions in Rajasthan that experience short monsoon seasons and erratic rainfall. Its early maturity allows it to escape late-season drought conditions effectively.

**139.** (D) It conserves soil moisture, prevents erosion, and lowers fuel costs.
Zero Tillage involves planting seeds directly into unploughed soil using specialized seed drills, leaving crop residues undisturbed on the surface. This practice conserves crucial soil moisture, reduces soil erosion caused by severe wind and water, improves organic matter retention, and cuts tractor fuel and labor expenses, providing an effective climate-resilient farming solution for dryland farmers across Rajasthan.

**140.** (B) Minimal soil tillage, permanent ground cover, and crop species diversification
Conservation Agriculture is built on three core, mutually reinforcing principles: minimizing mechanical soil disturbance through zero or reduced tillage, maintaining permanent soil organic cover using crop residues or cover crops, and practicing diversified crop rotations. Together, these principles restore soil biological health, reduce water evaporation, prevent erosion, and build long-term agricultural resilience against climate change.

NODIA

# CHAPTER 14

# Forestry and Animal Husbandry with Special Reference to Rajasthan

**1.** Which of the following best defines the concept of agroforestry?
(A) Cultivating forest trees exclusively on degraded public lands
(B) Integration of trees and shrubs with crop and animal farming systems on the same land unit
(C) Large-scale commercial plantation of a single tree species for timber extraction
(D) Growing agricultural crops in designated national parks and wildlife sanctuaries

**2.** The social forestry programme was officially recognized and promoted in India following the recommendations of which of the following commissions?
(A) Planning Commission (1950)
(B) Kothari Commission (1964)
(C) Swaminathan Commission (2004)
(D) National Commission on Agriculture (1976)

**3.** Under the classification of social forestry, planting of trees along roads, canals, and railway lines by the government is primarily categorized as which type of forestry?
(A) Extension forestry
(B) Farm forestry
(C) Community forestry
(D) Commercial forestry

**4.** Consider the following statements regarding Farm Forestry:
I. It involves farmers growing trees on their own farmlands for commercial and non-commercial purposes.
II. Farmers receive free or subsidized seedlings from the forest department.
III. It prohibits the cultivation of agricultural crops on the same piece of land.
Which of the above statement(s) is/are correct?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**5.** In forestry terminology, what does a silvopastoral system primarily integrate?
(A) Forestry trees with pasture and forage grasses
(B) Forestry trees with commercial aquaculture ponds
(C) Forestry trees with seasonal agricultural food crops
(D) Forestry trees with horticultural fruit orchards

**6.** What is the approximate percentage of recorded forest area out of the total geographical area of Rajasthan as per the India State of Forest Report (ISFR) 2021?
(A) 4.87 percent
(B) 7.41 percent
(C) 9.60 percent
(D) 12.15 percent

**7.** Match the legal classification of forests in Rajasthan in List I with their approximate share in the total recorded forest area in List II:
**List I: Legal Classification**
P. Reserved Forests
Q. Protected Forests
R. Unclassed Forests
S. Total Recorded Forest Area
**List II: Share / Area**
1. About 37.05%
2. About 6.52%
3. About 56.43%
4. About 32,863 sq. km
(A) P-1, Q-3, R-2, S-4
(B) P-3, Q-1, R-2, S-4
(C) P-1, Q-2, R-3, S-4
(D) P-2, Q-3, R-1, S-4

**8.** Arrange the following districts of Rajasthan in descending order of their total forest cover area (from highest to lowest) as per ISFR 2021:
I. Udaipur
II. Pratapgarh
III. Alwar

Downloaded from www.pdf.tube

IV. Baran

Which of the following options represents the correct arrangement?

(A) I, II, III, IV
(B) I, III, II, IV
(C) I, IV, II, III
(D) I, III, IV, II

**9.** Which of the following districts of Rajasthan records the lowest total forest cover area?

(A) Jodhpur
(B) Jaisalmer
(C) Hanumangarh
(D) Churu

**10.** Under the legal classification of forests in Rajasthan, which category restricts all activities like grazing and timber collection unless specifically permitted by the government?

(A) Reserved Forests
(B) Protected Forests
(C) Unclassed Forests
(D) Community Forests

**11.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).

**Assertion (A):** The total forest cover in Rajasthan is significantly lower than the national average.

**Reason (R):** The major part of Rajasthan falls under arid and semi-arid climatic zones characterized by low rainfall and high temperature.

Which of the following options is correct?

(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**12.** Which tree species, highly resilient to drought conditions, is known as the 'Kalpavriksha' of the Thar desert?

(A) Rohida (Tecomella undulata)
(B) Khejri (Prosopis cineraria)
(C) Babool (Acacia nilotica)
(D) Kummat (Acacia senegal)

**13.** Consider the following statements regarding the forests of the Aravalli region:

I. The Aravalli ranges act as a significant barrier against the eastward expansion of the Thar Desert.
II. Tropical dry deciduous forests are primarily found in the southern and eastern slopes of the Aravallis.
III. Dhok (Anogeissus pendula) is one of the most dominant tree species found in the Aravalli hills.
IV. Evergreen forests cover more than 50 percent of the total Aravalli forest area.

Which of the above statement(s) is/are correct?

(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I, II and IV

**14.** Tropical dry teak forests in Rajasthan are predominantly concentrated in which geographical region?

(A) Western arid region (Jaisalmer, Barmer, and Jodhpur)
(B) Northern region (Ganganagar, Hanumangarh, and Churu)
(C) Southern region (Banswara, Dungarpur, Pratapgarh)
(D) Eastern plains region (Bharatpur, Dholpur, Karauli)

**15.** The sub-tropical hill forests in Rajasthan are exclusively confined to which of the following locations?

(A) Harsh Hills, Sikar
(B) Chappan Hills, Barmer
(C) Taragarh Hills, Ajmer
(D) Mount Abu, Sirohi

**16.** Which of the following is the most significant ecological function of the natural vegetation found in the Thar region of Rajasthan?

(A) Providing high-quality hardwood timber for commercial furniture manufacturing
(B) Supporting large-scale industrial paper and cellulose pulp production
(C) Binding sand dunes and preventing soil erosion from high winds
(D) Enhancing state production of commercial rubber, latex, and natural resin

**17.** Which of the following plant species is NOT typically found in the natural vegetation of the Thar Desert?

(A) Phog (Calligonum polygonoides)
(B) Salar (Boswellia serrata)
(C) Ker (Capparis decidua)
(D) Thor (Euphorbia caducifolia)

NODIA

**18.** The concept of social forestry was heavily promoted in India primarily to achieve which of the following main objectives?
(A) To shift rural agricultural populations entirely toward state-managed forest occupations
(B) To privatize state national parks and wildlife sanctuaries for commercial eco-tourism development
(C) To clear-fell degraded natural forests and replace them with fast-growing exotic commercial timber species
(D) To reduce pressure on traditional forests by meeting rural fuelwood and fodder needs

**19.** Which of the following statements is incorrect regarding the components of the social forestry programme?
(A) Community forestry relies on government ownership of land where locals have no access to the produce.
(B) Farm forestry encourages farmers to plant trees on bunds and boundaries of their agricultural fields.
(C) Extension forestry involves planting trees on non-forest public lands like canal banks and roadsides.
(D) Social forestry aims to increase ecological balance while providing economic benefits to local communities.

**20.** Consider the following objectives of the social forestry programme:
I. To supply timber for large-scale heavy industries.
II. To provide employment opportunities to rural and landless workers.
III. To rehabilitate degraded lands and improve soil conservation.
Which of the above statement(s) is/are correct?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**21.** Match the social forestry components in List I with their primary location/focus in List II:
**List I: Social Forestry Component**
P. Farm Forestry
Q. Community Forestry
R. Extension Forestry
S. Recreation Forestry
**List II: Primary Location / Focus**
1. Village common lands and panchayat lands
2. Private agricultural lands
3. Urban parks and green belts for aesthetics
4. Roadsides, railway tracks, and canal banks
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-4, Q-1, R-2, S-3

**22.** In the context of Rajasthan, many large-scale social forestry and afforestation projects have historically received financial and technical assistance from which international agency?
(A) International Monetary Fund (IMF)
(B) World Health Organization (WHO)
(C) Asian Infrastructure Investment Bank (AIIB)
(D) Japan International Cooperation Agency (JICA)

**23.** Which of the following is NOT an intended outcome of a successful social forestry programme?
(A) Increase in the availability of non-timber forest products
(B) Complete elimination of agriculture to maximize tree cover
(C) Empowerment of village panchayats in natural resource management
(D) Stabilization of rural economy through secondary income sources

**24.** The Joint Forest Management (JFM) concept was formally introduced in India through the guidelines issued by the Ministry of Environment and Forests in which year?
(A) 1972
(B) 1980
(C) 1990
(D) 2006

**25.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
**Assertion (A):** The Joint Forest Management (JFM) programme shifts forest management from a purely policing approach to a participatory approach.
**Reason (R):** JFM requires the forest department and local communities to form partnerships for the protection and management of degraded forests.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.

Click Here to Buy book on Flipkart

grazing lands directly into high-yielding irrigated commercial agricultural fields

**41.** According to official economic data, the animal husbandry sector contributes approximately what percentage to the total Agriculture and Allied Sector Gross State Value Added (GSVA) at constant prices in Rajasthan?
(A) Less than 10%
(B) Between 20% to 25%
(C) Between 45% to 50%
(D) More than 75%

**42.** Which of the following statements is incorrect regarding the role of animal husbandry in Rajasthan's economy?
(A) Its economic contribution is far lower than the state mining sector.
(B) It acts as an indispensable economic safety net against frequent rainfed agricultural crop failures caused by recurrent droughts.
(C) It reliably provides direct, year-round productive employment and continuous household income to rural families.
(D) It serves as a vital primary source of essential nutritional security by continuously providing milk, dairy products, and meat.

**43.** In the context of Rajasthan's agrarian economy, what does the term 'mixed farming' predominantly refer to?
(A) Growing multiple diverse seasonal food crops on the exact same agricultural field simultaneously
(B) Rearing livestock alongside growing agricultural crops
(C) Integrating modern mechanized digital farming technology directly with age-old traditional agricultural practices
(D) Combining commercial forestry plantations and fish aquaculture operations completely without crop agriculture

**44.** Match the livestock category in List I with Rajasthan's approximate rank in India in terms of population as per the 20th Livestock Census in List II:
**List I: Livestock Category**
P. Camel
Q. Goat
R. Sheep
S. Buffalo
**List II: Rank in India**
1. First
2. Second
3. Fourth
4. First
(A) P-1, Q-1, R-3, S-2
(B) P-4, Q-2, R-1, S-3
(C) P-1, Q-2, R-4, S-3
(D) P-2, Q-1, R-3, S-4

**45.** Given below are two statements regarding livestock in Rajasthan:
**Statement I:** The livestock sector in Rajasthan shows higher resilience to climatic vagaries like drought compared to crop agriculture.
**Statement II:** Animals can be migrated (transhumance) to areas with better fodder and water availability during severe droughts, whereas standing crops cannot.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**46.** The 'Tharparkar' breed of cattle is predominantly found in which geographical region of Rajasthan?
(A) Hadoti region (Kota, Bundi, Baran, Jhalawar)
(B) Mewar region (Udaipur, Rajsamand, Chittorgarh)
(C) Western border region (Jaisalmer, Barmer)
(D) Shekhawati region (Sikar, Jhunjhunu, Churu)

**47.** Match the major cattle breeds of Rajasthan in List I with their primary distribution districts in List II:
**List I: Cattle Breed**
P. Rathi
Q. Kankrej
R. Gir (Renda)
S. Malvi
**List II: Primary Distribution Districts**
1. Jalore, Sirohi, Barmer
2. Bikaner, Ganganagar, Hanumangarh
3. Jhalawar, Pratapgarh
4. Ajmer, Bhilwara
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-4, Q-1, R-2, S-3

NODIA

**33.** The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds in Rajasthan are primarily utilized for which of the following activities?
(A) Providing direct emergency financial cash transfers to registered urban industrial factory workers
(B) Mitigating forest land diversion impacts through compensatory afforestation
(C) Funding the public construction and upgrading of major state highways and rural expressways
(D) Subsidizing heavy modern agricultural machinery and equipment for large-scale commercial farmers

**34.** Select the correct chronological sequence of the launch of the following environment and forestry-related policies/acts in India/Rajasthan:
I. Rajasthan State Forest Policy (First)
II. Wildlife (Protection) Act
III. Forest (Conservation) Act
(A) II, III, I
(B) I, II, III
(C) III, II, I
(D) II, I, III

**35.** The 'Harit Rajasthan' (Green Rajasthan) campaign, a massive tree plantation and environmental awareness drive, was initially launched by the State Government in which year?
(A) 2001
(B) 2009
(C) 2014
(D) 2019

**36.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
**Assertion (A):** The Harit Rajasthan programme emphasized maximum survival rate of planted saplings rather than just increasing the number of plantations.
**Reason (R):** High mortality of planted saplings due to lack of post-plantation care was a major historical challenge in afforestation drives in Rajasthan.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**37.** Which of the following is NOT an objective of the tree plantation drives conducted under the Harit Rajasthan framework?
(A) Replacing native flora with exotic ornamental plants
(B) Enhancing natural green canopy cover across urban municipal and rural village areas
(C) Increasing local community awareness and active participation in long-term tree conservation
(D) Checking severe wind erosion of topsoil and halting westward expansion of desertification

NODIA

**38.** The 'Ghar Ghar Aushadhi Yojana' launched by the Rajasthan Government is a unique initiative primarily aimed at:
(A) Distributing free emergency allopathic essential medicines to registered below-poverty-line families
(B) Establishing state-funded large-scale pharmaceutical manufacturing factories in every district headquarter
(C) Promoting specialized mobile veterinary pharmacies across remote and underserved desert village areas
(D) Distributing medicinal saplings to households for health awareness

**39.** Consider the following plant species distributed under the Ghar Ghar Aushadhi Yojana:
I. Tulsi
II. Giloy
III. Ashwagandha
Which of the above plants were part of the kit provided to families under this scheme?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**40.** Tree plantation drives on Gram Panchayat lands (Gochar/Oran) serve which of the following most appropriate long-term benefits?
(A) They allow immediate commercial privatization, real estate development, and direct sale of public common lands
(B) They secure a permanent, uninterrupted supply of commercial industrial timber for heavy manufacturing units exclusively
(C) Improving biodiversity, securing livestock fodder, and maintaining ecological balance
(D) They convert dry degraded community

**114.** (A) Cumin
Cumin is a commercial seed spice whose pricing is determined by open market supply and demand dynamics and export trade rather than official Minimum Support Price procurement. CACP recommends direct MSPs for commodities like raw cotton, raw jute, and copra, but does not announce MSP levels for spice crops like cumin, coriander, or fennel.

**115.** (B) 60:40
The Mission for Integrated Development of Horticulture (MIDH) is a Centrally Sponsored Scheme where funding is shared between the Central Government and State Governments in a 60:40 ratio for normal general category states, including Rajasthan. The central government provides 60 percent of the scheme's financial outlay, while the Rajasthan state government contributes the remaining 40 percent share.

**116.** (D) Rajasthan Horticulture Development Society (RHDS)
The Rajasthan Horticulture Development Society (RHDS) functions as the state-level nodal implementing agency for the National Horticulture Mission in Rajasthan. Registered under the Societies Act, RHDS coordinates scheme funds, executes horticultural development programs, oversees protected cultivation subsidies, promotes drip irrigation, and distributes high-quality planting materials to farmers across designated target districts in the state.

**117.** (C) The Centre of Excellence for Citrus fruits is located at Nanta, Kota.
Under the Indo-Israel Agricultural Project, Rajasthan established specialized Centres of Excellence to showcase advanced horticultural technologies. The Centre of Excellence for Citrus fruits is located at Nanta in Kota. Statement A is incorrect because the Pomegranate center is at Dindhol (Bassi, Jaipur), and Statement B is incorrect as the Mango center is situated at Kemri in Dholpur.

**118.** (B) Sagra Bhojka
The Centre of Excellence for Date Palm in Rajasthan is established at Sagra Bhojka in Jaisalmer district. Set up under the Indo-Israel collaboration, this facility conducts research on high-performing tissue culture date palm varieties, demonstrates efficient micro-irrigation systems, and provides quality offshoots to farmers to promote commercial date palm cultivation across western desert districts.

**119.** (D) To ensure end-to-end growth of horticulture from production to marketing
The National Horticulture Mission (NHM) aims to drive holistic, end-to-end development across the horticulture sector. Its comprehensive focus spans nursery production, area expansion, high-density planting, water management via micro-irrigation, protected cultivation, integrated pest and nutrient management, and post-harvest infrastructure like cold storage, pack houses, and market linkages to boost farmer returns.

**120.** (A) Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
The "Per Drop More Crop" initiative operates as a primary sub-scheme under the umbrella framework of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY). It focuses on maximizing water use efficiency at the farm level through micro-irrigation technologies like drip and sprinkler systems, precision water management, micro-level storage structures, and water-saving agricultural practices across water-stressed regions.

**121.** (C) 85-95%
Drip irrigation delivers exceptional Water Use Efficiency (WUE) ranging between 85 and 95 percent. By applying water slowly and directly to the plant root zone through network emitters, it eliminates surface runoff losses, minimizes deep percolation below roots, and drastically reduces weed and soil evaporation losses compared to conventional flood irrigation methods that achieve much lower efficiency.

**122.** (A) The state government does not provide any top-up subsidy; it relies entirely on the central grant.
Statement A is incorrect because the Rajasthan state government provides an additional top-up financial subsidy over and above the central grant under PMKSY to lower costs for farmers adopting micro-irrigation systems. Small, marginal, female, and SC/ST farmers receive higher total combined subsidy percentages, making drip and sprinkler technology more affordable and accessible statewide.

Downloaded from www.pdf.tube

**48.** Which of the following options is the odd one out among the given livestock breeds?
(A) Chokla sheep
(B) Magra sheep
(C) Jamnapari
(D) Pugal sheep

**49.** Consider the following statements regarding the 'Murrah' breed:
I. It is the most important breed of buffalo found in Rajasthan.
II. It is known for its high milk yield and high fat content in milk.
III. Its native tract is the Rohtak, Hisar, and Jind districts of Haryana, adjoining Rajasthan.
IV. It is primarily reared for fine quality wool production.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, III and IV
(C) II, III and IV
(D) I, II and IV

**50.** Which breed of cattle in Rajasthan is renowned nationwide for its fast and powerful draft capacity, making it excellent for agricultural operations and cart pulling?
(A) Gir
(B) Rathi
(C) Sahiwal
(D) Nagauri

**51.** Sirohi, Marwari, Barbari, and Jakhrana are prominent breeds of which livestock animal in Rajasthan?
(A) Goat
(B) Sheep
(C) Camel
(D) Buffalo

**52.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
**Assertion (A):** The Rathi breed of cattle is often referred to as the "Kamdhenu of Rajasthan".
**Reason (R):** It is an excellent milch breed highly adapted to the harsh climatic conditions of the north-western arid region.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**53.** Rajasthan holds a leading position in the dairy sector of India. According to recent Basic Animal Husbandry Statistics, Rajasthan generally ranks in which position for total milk production in the country?
(A) First or Second
(B) Fifth or Sixth
(C) Ninth or Tenth
(D) Below Fifteenth

**54.** The apex body for the cooperative dairy sector in the state, the Rajasthan Cooperative Dairy Federation (RCDF), was established in which year?
(A) 1955
(B) 1977
(C) 1991
(D) 2005

**55.** Given below are two statements regarding the cooperative dairy movement in Rajasthan:
**Statement I:** The dairy development in Rajasthan is modeled on the three-tier Anand Pattern cooperative structure.
**Statement II:** In this three-tier structure, the Rajasthan Cooperative Dairy Federation functions at the village level.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**56.** Arrange the following institutions of the dairy cooperative structure in Rajasthan from the lowest tier (bottom) to the highest tier (apex):
I. Rajasthan Cooperative Dairy Federation (RCDF)
II. Primary Dairy Cooperative Society (DCS)
III. District Milk Producers' Cooperative Union
Which of the following options represents the correct arrangement?
(A) I, II, III
(B) III, II, I
(C) II, III, I
(D) II, I, III

NODIA

and installing high-visibility motion lights around rural livestock holding sheds.
(D) Deploying specialized local guard dogs to actively alert pastoral herders of approaching wild carnivores near village grazing boundaries.

**124.** At the national level, which premier ICAR institute is primarily responsible for the registration and conservation of indigenous animal genetic resources and breeds, including those of Rajasthan?
(A) Indian Veterinary Research Institute (IVRI), Izatnagar
(B) National Bureau of Animal Genetic Resources (NBAGR)
(C) National Dairy Research Institute (NDRI), Karnal
(D) Central Arid Zone Research Institute (CAZRI), Jodhpur

**125.** The Sonadi breed of sheep, known for its long ears that touch the ground while grazing, is an indigenous breed requiring conservation efforts. It is native to which region of Rajasthan?
(A) Mewar (Udaipur, Dungarpur, Chittorgarh)
(B) Marwar (Jodhpur, Pali, Nagaur, Barmer)
(C) Shekhawati (Sikar, Jhunjhunu, Churu district)
(D) Matsya (Alwar, Bharatpur, Dholpur, Karauli)

**126.** Which of the following statements is incorrect regarding the conservation of livestock breeds?
(A) 'In-situ' conservation involves maintaining the breed in its natural habitat by the traditional rearing communities.
(B) 'Ex-situ' conservation includes deep cryopreservation of semen, ova, and viable embryos in centralized state gene banks.
(C) Indefinite crossbreeding with exotic breeds best conserves pure indigenous traits.
(D) The steady declining population of purebred draught cattle is largely driven by rapid agricultural mechanization.

**127.** Which of the following represents the most effective strategy for the 'in-situ' conservation of an endangered indigenous livestock breed in Rajasthan?
(A) Purchasing all remaining live animals from villagers and permanently housing them inside government zoological parks.
(B) Freezing their genetic reproductive material in laboratories while systematically slaughtering all remaining live farm animals.
(C) Indiscriminately crossbreeding them with imported foreign breeds to alter and improve their physical outward appearance.
(D) Providing financial incentives and breeding support to traditional pastoralists.

**128.** While dealing with the conservation of important animal breeds/species of the desert, the state has established a captive breeding centre for the highly endangered State Bird, the Great Indian Bustard (Godawan), at:
(A) Keoladeo National Park, Bharatpur district
(B) Ranthambore National Park, Sawai Madhopur
(C) Sam (Desert National Park), Jaisalmer
(D) Sitamata Wildlife Sanctuary, Pratapgarh

**129.** Given below are two statements regarding the importance of conserving indigenous animal breeds:
**Statement I:** Indigenous breeds like Tharparkar and Kankrej are highly resistant to tick-borne diseases and heat stress compared to exotic breeds.
**Statement II:** Conserving these traits is crucial for ensuring food security in the face of global climate change and rising temperatures.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**130.** Tendu leaves, a major Non-Timber Forest Product (NTFP) in Rajasthan, are primarily used for which of the following commercial purposes?
(A) Manufacturing of Ayurvedic medicines for malaria
(B) Production of natural dyes for the textile industry
(C) Making eco-friendly disposable plates
(D) Rolling of Bidis (traditional cigarettes)

**131.** In Rajasthan, the procurement and marketing of Minor Forest Produce (MFP) under the Minimum Support Price (MSP) scheme is

Click Here to Buy book on Amazon

correct.
(D) Both Statement I and Statement II are incorrect.

**67.** The State Disease Diagnostic Centre, the apex laboratory for animal disease diagnosis under the Animal Husbandry Department of Rajasthan, is located in:
(A) Jaipur
(B) Bikaner
(C) Jodhpur
(D) Udaipur

**68.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
**Assertion (A):** Preventive vaccination of livestock against endemic diseases like HS (Hemorrhagic Septicemia) and BQ (Black Quarter) is typically carried out before the onset of the monsoon.
**Reason (R):** The incidence and spread of these bacterial diseases rapidly increase during the rainy season due to high humidity and water accumulation.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**69.** In the context of traditional pasture management in Rajasthan, what does the term 'Oran' signify?
(A) Sacred community groves dedicated to local deities where tree cutting is prohibited
(B) Highly developed commercial grazing lands owned and managed directly by the state government
(C) Completely degraded, barren public wasteland areas totally unfit for any livestock grazing activities
(D) Modern state-of-the-art fenced indoor enclosures designed exclusively for stall-feeding elite dairy cattle

**70.** Consider the following challenges in fodder production in Rajasthan:
I. Shrinkage and encroachment of traditional grazing lands (Gochar).
II. High dependence on rainfed agriculture leading to seasonal fodder deficits.
III. Over-dominance of highly nutritious, perennial grasses in every district.
Which of the above statement(s) represents actual challenges?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**71.** Which highly nutritious and drought-resistant grass is predominantly found in the Lathi series region of Jaisalmer and is crucial for pasture management in the Thar desert?
(A) Dhaman
(B) Sewan
(C) Karad
(D) Anjan

**72.** The promotion of a 'silvopastoral system' in arid regions is primarily aimed at:
(A) Maximizing agricultural grain crop yields through complete elimination of livestock grazing activities.
(B) Systematically clearing all indigenous natural desert grasses to establish exotic fast-growing timber plantations.
(C) Producing trees and livestock forage on the same land to boost productivity.
(D) Establishing strictly protected national wildlife sanctuaries while completely excluding all domestic livestock species.

**73.** Select the correct order of ecological succession stages generally observed during the severe degradation of a pasture land in arid regions due to overgrazing:
I. Bare soil and severe erosion
II. Climax perennial grasses (e.g., Sewan, Dhaman)
III. Unpalatable weeds and thorny shrubs
IV. Less palatable annual grasses
(A) II, IV, III, I
(B) I, II, III, IV
(C) IV, III, II, I
(D) II, III, IV, I

**74.** Recognizing its cultural and economic significance, the camel was declared the State Animal (Livestock Category) of Rajasthan in which year?
(A) 2001
(B) 2010
(C) 2014
(D) 2019

NODIA

**57.** Which brand name is used by the Rajasthan Cooperative Dairy Federation (RCDF) to market its milk and milk products?
(A) Amul
(B) Sudha
(C) Verka
(D) Saras

**58.** Consider the following functions of the Rajasthan Cooperative Dairy Federation (RCDF):
I. Organizing milk procurement through district unions.
II. Setting up cattle feed plants to supply quality feed to farmers.
III. Completely banning the sale of milk by private dairy vendors in the state.
Which of the above statement(s) is/are correct?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**59.** The 'White Revolution' in India, which inspired the cooperative dairy movement in Rajasthan, was spearheaded by which of the following visionaries?
(A) M. S. Swaminathan
(B) Verghese Kurien
(C) Norman Borlaug
(D) Sam Pitroda

**60.** The success of the 'Anand Pattern' cooperative model, replicated in Rajasthan, is primarily attributed to which core mechanism?
(A) Direct centralized management of milk procurement, daily pricing, and distribution by state government bureaucrats.
(B) Ownership and control of production, processing, and marketing by producers themselves.
(C) Complete corporate privatization of rural dairy farms and procurement centers by large multinational conglomerates.
(D) Providing extensive public subsidies for importing foreign milk powder and dairy products to fulfill local consumer demand.

**61.** The massive dairy development programme that triggered the White Revolution in India was named:
(A) Operation Flood
(B) Operation Green
(C) Operation Milk Stream
(D) Operation Dhawal

**62.** Consider the following impacts of the White Revolution on the rural economy:
I. Elimination of middlemen in the milk procurement process.
II. Assured and remunerative market for milk producers throughout the year.
III. Significant improvement in rural women's empowerment through participation in dairy cooperatives.
IV. A drastic reduction in the overall livestock population of the country.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**63.** The acronym 'AMUL', the model which Rajasthan's dairy cooperatives follow, stands for:
(A) Asian Milk Union Limited
(B) Allied Milk United League
(C) Autonomous Milk Unit of Lok
(D) Anand Milk Union Limited

**64.** Which of the following is NOT a viral disease affecting livestock in Rajasthan?
(A) Foot and Mouth Disease (FMD)
(B) Lumpy Skin Disease (LSD)
(C) Hemorrhagic Septicemia (HS)
(D) Peste des Petits Ruminants (PPR)

**65.** The highly contagious Foot and Mouth Disease (FMD) in cattle and buffaloes is caused by a:
(A) Bacteria
(B) Virus
(C) Fungus
(D) Parasite

**66.** Given below are two statements regarding veterinary services in Rajasthan:
**Statement I:** The Government of Rajasthan has introduced Mobile Veterinary Units (MVUs) linked to a centralized toll-free helpline number (1962).
**Statement II:** The primary purpose of MVUs is to provide veterinary health care directly at the doorstep of the livestock rearer.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are

Downloaded from www.pdf.tube

compared to large ruminants like cows and buffaloes.
III. It provides a quick return on investment due to its short generation interval and high prolificacy.
Which of the above statements correctly explain its popularity among marginal farmers?
(A) Only I and II
(B) Only II and III
(C) Only I and III
(D) I, II and III

**84.** The Central Sheep and Wool Research Institute (CSWRI), an apex research body under ICAR, is located at:
(A) Vallabhnagar, Udaipur district
(B) Bassi, Jaipur district
(C) Avikanagar, Malpura (Tonk)
(D) Suratgarh, Ganganagar district

**85.** Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
**Assertion (A):** Sheep rearing in Rajasthan is heavily concentrated in the arid and semi-arid western districts.
**Reason (R):** The dry climate prevents common parasitic diseases found in humid areas, and sheep are well adapted to graze on the short, sparse vegetation of the desert.
Which of the following options is correct?
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**86.** The famous 'Shri Veer Teja Ji Animal Fair', one of the largest livestock fairs in Rajasthan in terms of revenue, is held annually at:
(A) Jhalrapatan, Jhalawar district
(B) Tilwara, Balotra district
(C) Pushkar, Ajmer district
(D) Parbatsar (Didwana-Kuchaman)

**87.** Which of the following pairs of livestock fair and its organizing district is correctly matched?
(A) Gogamedi Animal Fair — Bikaner district
(B) Chandrabhaga Animal Fair — Jhalawar
(C) Mallinath Animal Fair — Jaisalmer district
(D) Mahashivratri Animal Fair — Nagaur district

**88.** Arrange the following major animal fairs of Rajasthan in the chronological order of their occurrence according to the Hindu calendar months (from Chaitra onwards):
I. Mallinath Animal Fair (Tilwara)
II. Pushkar Animal Fair (Pushkar)
III. Gogamedi Animal Fair (Nohar)
Which of the following options represents the correct arrangement?
(A) I, II, III
(B) I, III, II
(C) III, I, II
(D) II, I, III

**89.** The Mallinath Animal Fair, known for the trading of Tharparkar and Kankrej cattle, is held on the banks of which river?
(A) Banas
(B) Chambal
(C) Mahi
(D) Luni

**90.** Which of the following fairs is NOT primarily known for the trading of the Nagauri breed of cattle?
(A) Shri Gomati Sagar Animal Fair (Jhalrapatan)
(B) Shri Ramdev Animal Fair, Nagaur district
(C) Shri Baldev Animal Fair, Merta City (Nagaur)
(D) Shri Veer Teja Ji Animal Fair, Parbatsar town

**91.** The globally renowned Pushkar Fair, which serves as a massive trading ground for camels, horses, and cattle, is held during which Hindu month?
(A) Chaitra
(B) Shravan
(C) Kartik
(D) Phalgun

**92.** The 'Mukhyamantri Kamdhenu Pashubima Yojana' in Rajasthan provides insurance coverage up to what maximum amount per milch animal?
(A) ₹10,000
(B) ₹20,000
(C) ₹40,000
(D) ₹80,000

**93.** Consider the following statements regarding the 'Mukhyamantri Kamdhenu Pashubima Yojana':
I. It provides free insurance for up to two milch animals per family.
II. Its objective is to protect livestock owners

NODIA

from financial loss due to the sudden death of their milch cattle.
III. It is available only for exotic crossbred cows and completely excludes indigenous breeds.
IV. Lumpy Skin Disease (LSD) outbreak prompted increased demand for such insurance schemes.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I, III and IV

**94.** Given below are two statements regarding livestock insurance schemes in general:
**Statement I:** In most government-sponsored livestock insurance schemes, farmers from SC/ST/BPL categories are provided a higher percentage of premium subsidy compared to general category farmers.
**Statement II:** The primary goal of premium subsidies is to make insurance affordable for marginalized farmers who depend heavily on livestock.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**95.** Which of the following statements is incorrect regarding the 'Pashu Mitra Yojana' in Rajasthan?
(A) It aims to actively engage unemployed qualified veterinary graduates and trained rural youth directly at the village level.
(B) Pashu Mitras reliably provide door-to-door primary veterinary services such as health vaccination and artificial insemination.
(C) It effectively helps in bridging the operational gap between the state veterinary department and remote pastoral livestock rearers.
(D) It prohibits Pashu Mitras from charging any service fees.

**96.** The 'e-GOPALA' application, promoted under national and state livestock programmes, is primarily designed for:
(A) Monitoring and real-time tracking of the movement of endangered wild animals across state sanctuaries and national parks
(B) Fully automating and modernizing the mechanical milking process within large-scale commercial private dairy farms
(C) A digital platform for farmers to manage livestock health and trade disease-free germplasm
(D) Processing and approving financial export trade subsidies for large commercial meat processing and exporting companies

**97.** In the administration of livestock insurance, what is the most critical purpose of affixing a polyurethane (PU) tag to the ear of the insured animal?
(A) To improve the cosmetic appearance of the animal for livestock fairs
(B) To uniquely identify the insured animal and prevent fraudulent claims
(C) To electronically track the daily grazing route of the animal
(D) To automatically dispense medication to the animal

**98.** Which of the following best defines the technique of Artificial Insemination (AI) in livestock?
(A) Facilitating the natural mating of high-yielding purebred animals within a strictly controlled breeding environment
(B) Performing the surgical transfer of an embryo from a genetically superior donor cow into a surrogate recipient mother
(C) Direct laboratory genetic modification and alteration of an animal's DNA structure to boost milk production capacity
(D) Manual introduction of processed semen into the female reproductive tract for conception

**99.** To preserve its viability for a long duration, frozen semen used for artificial insemination is stored in liquid nitrogen at a temperature of:
(A) 0 °C (273.15 K)
(B) -20 °C
(C) -79 °C
(D) -196 °C

**100.** Which of the following is a primary advantage of Artificial Insemination (AI) in breed improvement programmes?
(A) It drastically increases the overall daily feed and nutrient consumption of the female animal.
(B) It guarantees a 100% successful conception rate on the very first attempt without any failure.

Click Here to Buy book on Flipkart

(C) A superior sire can be used to inseminate thousands of females.
(D) It completely eliminates any future requirement for professional veterinary medical intervention.

**101.** What is the primary purpose of introducing 'Sex-Sorted Semen' technology in Rajasthan's breed improvement programmes?
(A) To ensure calves are female, rapidly increasing the milch cattle population.
(B) To significantly increase the birth rate of male calves specifically for draft operations in traditional agriculture.
(C) To completely eliminate all potential viral and bacterial pathogens present in raw semen prior to insemination.
(D) To produce novel hybrid animal species by systematically crossbreeding domestic cattle with riverine buffaloes.

**102.** Given below are two statements regarding Embryo Transfer Technology (ETT):
**Statement I:** ETT allows a genetically superior female (donor) to produce multiple offspring in a single year with the help of surrogate mothers.
**Statement II:** ETT is currently cheaper and easier to perform at the village level than standard Artificial Insemination (AI).
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**103.** The National Livestock Mission (NLM), an initiative of the Government of India implemented in states like Rajasthan, was originally launched in which financial year?
(A) 2005-06
(B) 2010-11
(C) 2014-15
(D) 2020-21

**104.** The revamped National Livestock Mission (2021-22 onwards) focuses on entrepreneurship development. Which of the following is NOT one of the core sub-missions under the revamped NLM?
(A) Sub-Mission on Breed Development of Livestock and Poultry
(B) Sub-Mission on Feed and Fodder Development
(C) Sub-Mission on Eradication of FMD and Brucellosis
(D) Sub-Mission on Innovation and Extension

**105.** Select the correct logical sequence of steps for an individual seeking to establish a rural poultry entrepreneurship unit under the National Livestock Mission (NLM):
I. Approval by the State Level Executive Committee (SLEC)
II. Submission of a Detailed Project Report (DPR) online
III. Disbursement of subsidy through SIDBI/ Bank
IV. Verification of infrastructure by the implementing agency
Which of the following options represents the correct sequence?
(A) II, I, IV, III
(B) I, II, III, IV
(C) II, IV, I, III
(D) IV, II, I, III

**106.** Under the entrepreneurship development component of the National Livestock Mission, emphasis is heavily placed on the establishment of breeder farms for sheep, goat, and poultry. Why?
(A) To supply high-quality, disease-free germplasm locally, reducing distant dependency.
(B) To systematically shift rural agrarian populations away from crop agriculture toward industrial factory manufacturing.
(C) To strictly promote and mandate the large-scale commercial export of live farm animals to foreign international markets.
(D) To legally mandate the complete replacement and phasing out of traditional cattle dairies in favor of commercial poultry.

**107.** Which of the following statements is incorrect regarding the feed and fodder development component of the National Livestock Mission?
(A) It provides comprehensive financial assistance for setting up state-wide fodder seed multiplication and distribution networks.
(B) It prohibits native grass cultivation and only subsidizes exotic fodder crops.
(C) It actively encourages the establishment of

Downloaded from www.pdf.tube

**75.** Match the major camel breeds of Rajasthan in List I with their defining characteristic or primary utility in List II:

**List I: Camel Breed**

P. Bikaneri
Q. Jaisalmeri
R. Mewari
S. Gomath

**List II: Defining Characteristic / Utility**

1. Known for high speed and used by border security forces
2. Best known for riding and fast trotting (often found in Phalodi/Jodhpur region)
3. Heavy draft breed, known for prominent 'stop' (depression) on the forehead
4. Adapted to hilly terrain, known for its pendulous lower lip

(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-1, R-4, S-3

**76.** Which of the following statements is incorrect regarding camel rearing in Rajasthan?

(A) The Raika/Rebari community has traditionally been the primary camel herding community in Rajasthan.
(B) The population of camels in Rajasthan has seen a steep increase over the last two decades.
(C) Camel milk is highly rich in Vitamin C and insulin-like proteins, beneficial for diabetics.
(D) The camel is often referred to as the 'Ship of the Desert' due to its unique anatomical adaptations.

**77.** Given below are two statements regarding the cultural importance of camels:

**Statement I:** 'Usta art' is a famous traditional art form of Bikaner characterized by intricate golden work on camel hide.

**Statement II:** Camel shearing and ornamentation is a major cultural event featured in the annual Bikaner Camel Festival.

Which of the following options is correct?

(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**78.** Consider the following factors contributing to the decline in the camel population in Rajasthan:

I. Expansion of mechanization in agriculture and rural transport.
II. Shrinking of traditional grazing lands and restrictions on forest grazing.
III. Stringent regulations on the export and trade of camels outside the state.
IV. Massive outbreak of bird flu among the camel herds.

Which of the above statement(s) is/are correct?

(A) I, II and IV
(B) I, II and III
(C) II, III and IV
(D) I, III and IV

**79.** The National Research Centre on Camel (NRCC), a premier institute dedicated to camel health, breeding, and research, is located in:

(A) Jaisalmer
(B) Barmer
(C) Jodhpur
(D) Bikaner

**80.** Rajasthan is the largest producer of wool in India. Approximately what proportion of the country's total wool production is contributed by Rajasthan?

(A) 15-20 percent
(B) 25-30 percent
(C) 40-45 percent
(D) 75-80 percent

**81.** Which breed of sheep in Rajasthan is renowned for producing high-quality fine wool and is often referred to as the 'Indian Merino'?

(A) Marwari
(B) Chokla
(C) Malpura
(D) Sonadi

NODIA

**82.** Which of the following options is the odd one out among the given livestock breeds?

(A) Nali
(B) Pugal
(C) Magra
(D) Surti

**83.** Consider the following statements regarding the goat, often called the 'poor man's cow' in Rajasthan:

I. It is highly resilient and can survive on sparse vegetation in degraded lands.
II. It requires very high initial capital investment

system.
(D) Dependence entirely on intensively cultivated high-moisture green fodder crops like berseem, lucerne, and hybrid napier grass.

**116.** In terms of livestock distribution in Rajasthan, the arid western region holds the highest concentration of which combination of animals?
(A) Buffaloes and Pigs
(B) Poultry and Exotic Cattle
(C) Sheep, Goats, and Camels
(D) Yaks and Mithuns

**117.** What is the most appropriate economic rationale for pastoralists in the desert maintaining a 'multi-species herd'?
(A) It ensures that if a disease strikes one species, the farmer still has other species to rely on, thus acting as a risk-mitigation strategy.
(B) It eliminates the need for any water consumption by the herd.
(C) It allows the farmer to receive the exact same market price for all animals.
(D) It makes the transportation of animals by trucks easier.

**118.** Which of the following options is the odd one out among the given traditional fodder trees/shrubs found in the desert animal husbandry system?
(A) Khejri (Prosopis cineraria)
(B) Bordi/Ber (Ziziphus mauritiana)
(C) Ardu (Ailanthus excelsa)
(D) Mangrove (Rhizophora)

**119.** A major concern in areas where forests and grazing lands overlap is the transmission of infectious diseases. Which of the following diseases can easily spill over from domestic cattle to wild herbivores (like deer and antelope) grazing in the same area?
(A) Rabies virus infection
(B) Foot and Mouth Disease (FMD)
(C) Canine Distemper Virus
(D) Highly pathogenic Avian Influenza virus

**120.** To mitigate the economic impact of wildlife-livestock conflict, the Forest Department of Rajasthan provides which of the following?
(A) Providing free licensed firearms directly to rural livestock rearers to hunt down and eliminate problem predators.
(B) Granting immediate legal permission to clear and deforest the specific reserve area where the livestock predation occurred.
(C) Financial compensation to owners for livestock lost to wild predators.
(D) Enforcing a total blanket ban on all domestic livestock rearing and grazing activities within a 50 km radius of any forest boundary.

**121.** What is the most widely accepted long-term ecological measure to reduce the depredation of livestock by large wild carnivores (like leopards) in Rajasthan?
(A) Systematically eradicating or capturing all large wild carnivores permanently from designated sanctuary and reserve forest areas.
(B) Regularly feeding wild carnivores with commercially procured raw meat distributed at fixed feeding stations by forest department personnel.
(C) Forcibly relocating all traditional livestock herds from forest villages to completely indoor, highly mechanized multi-story urban farms.
(D) Improving forest prey base and habitat so predators stay within reserves.

**122.** Given below are two statements regarding threats to wildlife from livestock-related activities:
**Statement I:** Free-ranging feral dogs associated with pastoral herds pose a severe threat to ground-nesting endangered birds like the Great Indian Bustard (Godawan).
**Statement II:** Feral dogs can hunt chicks and destroy the eggs of these endangered species in the Desert National Park region.
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**123.** Which of the following is NOT an effective preventive measure for managing leopard-livestock conflict in the Aravalli region?
(A) Constructing sturdy, predator-proof enclosed livestock corrals and pens specifically designed for safe night-time shelter.
(B) Grazing livestock in sanctuary core areas during dawn and dusk.
(C) Improving night-time solar illumination

Click Here to Buy book on Amazon

modern silage-making units to systematically preserve green fodder for dry drought seasons.

(D) It promotes the creation of dense fodder block-making processing units to significantly ease the long-distance transportation of roughage.

**108.** What is the standard rate of capital subsidy provided to eligible entrepreneurs for establishing sheep/goat/pig/poultry breeding farms under the revamped National Livestock Mission?

(A) 10%
(B) 25%
(C) 50%
(D) 90%

**109.** To comprehensively manage and protect the welfare of cattle, the Government of Rajasthan established a dedicated 'Directorate of Gopalan' in which year?

(A) 2005
(B) 2010
(C) 2014
(D) 2019

**110.** Under the current cattle conservation policies of the Rajasthan Government, for how many months in a year is the maintenance grant (Anudan) typically provided to registered Gaushalas?

(A) 3 months
(B) 6 months
(C) 9 months
(D) 12 months

**111.** What is the primary objective of the 'Nandishala Yojana' implemented by the Directorate of Gopalan in Rajasthan?

(A) To construct state-of-the-art high-tech automated commercial milking parlors in primary urban centers
(B) To facilitate and promote the commercial export of elite high-quality indigenous breeding bulls to other neighboring states
(C) To promote artificial insemination exclusively using imported jersey bull semen
(D) To build shelters for destitute stray male cattle at the Panchayat Samiti level

**112.** Given below are two statements regarding the Gaushala system:

**Statement I:** The Rajasthan government provides financial assistance to Gaushalas for the establishment of biogas plants.

**Statement II:** Biogas plants in Gaushalas help in managing cow dung efficiently, producing renewable energy, and generating organic manure.

Which of the following options is correct?

(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**113.** Which of the following is generally NOT a mandatory criterion for a Gaushala to be eligible for government maintenance grants in Rajasthan?

(A) The Gaushala must be officially registered under the provisions of the Rajasthan Goshala Act, 1960.
(B) The Gaushala must exclusively house exotic crossbred cows.
(C) The Gaushala must continuously house a minimum specified number of cattle inside its facilities (e.g., 200 heads).
(D) The Gaushala must legally possess and own a minimum specified area of land for housing and grazing.

**114.** The practice of moving livestock from the dry western regions of Rajasthan to the Malwa region of Madhya Pradesh or towards Gujarat during the severe summer and returning after the monsoon is technically known as:

(A) Zero-grazing / Cut-and-carry fodder system
(B) Intensive commercial feedlot livestock farming
(C) Integrated agro-silvopastoral management system
(D) Transhumance / Nomadic pastoralism

**115.** Which of the following is a key characteristic adaptation of the desert animal husbandry system in Rajasthan?

(A) Rearing multi-species herds to optimize the use of sparse vegetation.
(B) Total year-round reliance on indoor stall-feeding using commercially manufactured dry and green cattle feed mixtures.
(C) Complete and permanent exclusion of all small ruminants (sheep and goats) from the traditional domestic herd management

NODIA

primarily facilitated by which nodal cooperative federation?
(A) RAJAS Sangh (Rajasthan Tribal Area Development Cooperative Federation)
(B) RAJFED (Rajasthan State Cooperative Marketing Federation Limited, Apex Body)
(C) RCDF (Rajasthan Cooperative Dairy Federation Limited)
(D) RSIC (Rajasthan Small Industries Corporation Limited)

**132.** Which of the following products extracted from forests is legally NOT classified as a Non-Timber Forest Product (NTFP) or Minor Forest Produce?
(A) Wild Mahua flowers and seeds
(B) Natural Forest Honey and Bee Wax
(C) Commercial Teak Wood (Timber)
(D) Natural Plant Gum and Tree Resins

**133.** Identify the correct pair of the Non-Timber Forest Product (NTFP) and its primary plant source in Rajasthan:
(A) Katha — Acacia catechu (Khair)
(B) Guggul — Prosopis cineraria (Khejri)
(C) Lac — Tecomella undulata (Rohida)
(D) Rosha grass — Boswellia serrata (Salar)

**134.** The traditional extraction of 'Katha' (catechu) from Khair trees in the southern forests of Rajasthan is historically associated with which tribal community?
(A) Sahariya
(B) Garasia
(C) Meena
(D) Kathodi

**135.** Why is the Mahua tree (Madhuca longifolia) considered highly vital for the forest-based livelihoods of tribal communities in southern Rajasthan?
(A) Its wood is the exclusive primary raw material utilized for manufacturing traditional tribal bows and hunting arrows.
(B) Flowers provide food and traditional liquor, while seeds yield edible oil.
(C) Its dense green leaves serve as the sole primary diet for rare endemic silkworm species inhabiting the Aravalli range.
(D) Its thick outer bark naturally yields a highly lucrative and expensive synthetic commercial rubber compound.

**136.** An integrated farming system that deliberately combines agricultural crops, forest trees, and livestock rearing on the same piece of land is technically termed as:
(A) Intensive silviculture
(B) Commercial monoculture farming
(C) Agrosilvopastoral system
(D) Traditional shifting cultivation

**137.** Which of the following best describes the ecological synergy achieved in an integrated agriculture-forestry-animal husbandry model?
(A) Trees aggressively compete with crops for sunlight and water, reducing overall crop yield, while grazing livestock continuously destroys all growing tree saplings.
(B) Agricultural crop cultivation requires the complete clearance of all trees, after which livestock is brought in temporarily to graze remaining crop stubble.
(C) Livestock is maintained entirely inside closed sheds, fed on imported synthetic feed, while agricultural crops and trees are sprayed heavily with chemical fertilizers.
(D) Trees feed livestock; livestock manures crops and trees; crops feed humans and livestock.

**138.** Given below are two statements regarding the integrated farming model in Rajasthan:
**Statement I:** The integrated agriculture-forestry-animal husbandry model significantly reduces the risk of complete livelihood failure for a farmer during severe droughts.
**Statement II:** If the rainfed agricultural crop fails, the farmer can still derive income and sustenance from the drought-resistant trees (fruits/fodder) and livestock products (milk/wool).
Which of the following options is correct?
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

**139.** What is the major ecological benefit of incorporating forestry (trees like Khejri) into agricultural fields (agroforestry) in the arid regions of Rajasthan?
(A) It substantially increases the mineral salinity of topsoil layers, thereby artificially forcing

Downloaded from www.pdf.tube

**9.** (D) Churu
Churu district registers the lowest total forest cover area in Rajasthan according to official forestry assessments. Arid climatic conditions, sandy terrain, low annual precipitation, and extreme temperature fluctuations restrict natural tree growth throughout this northern desert district. Consequently, forest vegetation remains sparse, consisting primarily of low-density thorny bushes, scattered shrubs, and drought-hardy xerophytic plant species across open tracts.

**10.** (A) Reserved Forests
Reserved forests represent the most strictly controlled legal category under Indian forestry legislation. In these forests, all activities including livestock grazing, timber extraction, tree felling, and non-timber collection are completely prohibited unless explicit prior permission is granted by authorized state forest officials. This rigorous legal status aims to conserve critical watersheds, pristine ecosystems, and valuable forest resources from human encroachment.

**11.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Rajasthan's overall forest cover remains substantially below the national average due to prevailing hyper-arid and semi-arid climatic conditions across its western regions. High summer temperatures, low and erratic monsoon precipitation, rapid evaporation rates, and sandy soils severely restrict natural tree growth. Consequently, environmental constraints directly explain the limited spatial extent of natural forest vegetation throughout the state.

**12.** (B) Khejri (Prosopis cineraria)
Khejri is widely celebrated as the Kalpavriksha of the Thar desert owing to its exceptional socio-economic and ecological importance in arid regions. Highly resilient to prolonged drought conditions, this evergreen deep-rooted tree fixes atmospheric nitrogen, enriches surrounding topsoil, supplies nutritious green fodder called loong, yields edible pods called sangri, and provides vital shade during extreme desert summers.

**13.** (A) I, II and III
The Aravalli range forms a critical ecological barrier preventing the eastward advance of desert sands into fertile plains. Southern and eastern slopes receive moderate rainfall, supporting tropical dry deciduous forests dominated by Dhok trees. Evergreen forests are strictly localized around Mount Abu and do not exceed fifty percent of the total Aravalli forest area, making that particular claim factual incorrect.

**14.** (C) Southern region (Banswara, Dungarpur, Pratapgarh)
Tropical dry teak forests in Rajasthan are predominantly concentrated in the southern districts including Banswara, Dungarpur, and Pratapgarh. These areas receive higher annual rainfall compared to western desert plains and feature favorable sub-humid climatic conditions along southern Aravalli hillsides. Teak trees thrive in these southern pockets, forming valuable timber reserves alongside mixed deciduous broadleaf species.

**15.** (D) Mount Abu, Sirohi
Sub-tropical hill forests in Rajasthan are exclusively confined to the elevated terrain surrounding Mount Abu in Sirohi district. Situated at altitudes exceeding 1,000 meters above sea level, this localized zone experiences cooler temperatures and higher annual precipitation than surrounding plains. The region supports unique vegetation including semi-evergreen plant species, rare orchids, wild mango trees, and diverse subtropical floral communities.

**16.** (C) Binding sand dunes and preventing soil erosion from high winds
The primary ecological role of natural vegetation in the Thar desert involves stabilizing fragile sand dunes and checking severe wind-driven topsoil erosion. Deep-rooted xerophytic plants, shrubs, and desert grasses anchor loose sandy soils, reduce surface wind velocities, and prevent soil moisture loss. This natural vegetative cover plays an essential role in halting desertification across arid agricultural landscapes.

**17.** (B) Salar (Boswellia serrata)
Salar is a characteristic tree species of dry deciduous hill forests found along rocky Aravalli slopes rather than open sand dunes of the Thar desert. In contrast, Phog, Ker, and Thor represent specialized xerophytic species perfectly adapted to hyper-arid conditions, featuring reduced leaves, deep taproots, and fleshy stems designed to minimize water loss across desert environments.

NODIA

# ANSWERS

**1.** (B) Integration of trees and shrubs with crop and animal farming systems on the same land unit
Agroforestry represents an integrated land-use management system combining woody perennials like trees and shrubs with agricultural crops or livestock on the same land unit. This practice optimizes ecological, economic, and social benefits through spatial or temporal interactions. It enhances soil fertility, prevents land degradation, diversifies farm revenue streams, and maintains ecosystem balance sustainably across various ecological landscapes.

**2.** (D) National Commission on Agriculture (1976)
The social forestry programme gained formal recognition and structured promotion in India following the interim report of the National Commission on Agriculture in 1976. The commission highlighted the urgent need to reduce rural dependence on natural forests by growing trees on uncultivated lands, panchayat common lands, and farm boundaries to satisfy local demands for fuelwood and fodder.

**3.** (A) Extension forestry
Extension forestry involves planting trees on non-forest lands along linear strips such as roadsides, railway lines, canal banks, and waste lands. This component of social forestry aims to extend tree cover beyond traditional forest boundaries, protecting infrastructure, mitigating wind erosion, offering shade to travelers, and meeting localized rural demands for fuelwood, timber, and green fodder reserves.

**4.** (A) Only I and II
Farm forestry encourages individual agricultural producers to plant timber, fruit, or fodder trees on their private lands, field boundaries, and bunds. Forest departments support farmers by supplying free or subsidized saplings. This practice integrated seamlessly with crop cultivation rather than prohibiting agricultural crops, allowing farmers to generate additional income while maintaining traditional crop production without land-use conflicts.

**5.** (A) Forestry trees with pasture and forage grasses
A silvopastoral system is a specialized agroforestry practice combining woody tree species with forage grasses and livestock production on the same land unit. Trees provide shade, improve soil microclimate, and yield supplementary fodder, while underlying perennial grasses support sustainable livestock grazing. This dual arrangement maximizes land productivity, conserves soil moisture, and prevents pasture degradation in dry conditions.

**6.** (C) 9.60 percent
According to the India State of Forest Report 2021, the recorded forest area of Rajasthan stands at approximately 32,863 square kilometers. This total constitutes nearly 9.60 percent of the state's total geographical expanse of 342,239 square kilometers. Legally classified into reserved, protected, and unclassed categories, this forest cover remains predominantly distributed across the eastern and southern Aravalli tracts.

**7.** (A) P-1, Q-3, R-2, S-4
In Rajasthan, recorded forest area totals approximately 32,863 square kilometers. Legal classification categorizes reserved forests at around 37.05 percent, where strict legal protection applies. Protected forests constitute the largest proportion at roughly 56.43 percent, allowing regulated public usage rights. Unclassed forests account for the remaining 6.52 percent, representing areas without specific statutory restrictions on forest produce or grazing access.

**8.** (B) I, III, II, IV
As per the India State of Forest Report 2021, forest cover area varies significantly across Rajasthan districts. Udaipur holds the largest forest area in the state, followed by Alwar in second position. Pratapgarh ranks third among these districts, while Baran features fourth in total forest cover. This geographic distribution reflects regional rainfall variations and hilly Aravalli topography.

Click Here to Buy book on Flipkart

higher seasonal crop yield.

(B) Deep roots recycle leached nutrients while the canopy acts as a protective windbreak.

(C) The mature trees rapidly absorb all underlying subsoil groundwater reserves, forcing farmers to adopt strict dryland farming techniques.

(D) It actively encourages the massive population proliferation and nesting of crop-destroying migratory bird species across farm fields.

**140.** Which of the following is NOT an economic advantage of adopting an integrated agriculture-forestry-animal husbandry model?

(A) Diversification of income sources throughout the year

(B) Complete elimination of the need for human labor on the farm

(C) Drastic reduction in the need for purchasing external inputs like chemical fertilizers

(D) Optimal utilization of farm by-products and waste

www.nodia.in

NODIA

**18.** (D) To reduce pressure on traditional forests by meeting rural fuelwood and fodder needs
The social forestry initiative was introduced in India to meet the daily timber, fuelwood, small construction wood, and livestock fodder requirements of rural communities. By cultivating trees on farm boundaries, degraded lands, and public spaces outside designated reserves, the programme successfully reduces human and livestock pressure on natural state forests, conserving fragile woodland ecosystems from degradation.

**19.** (A) Community forestry relies on government ownership of land where locals have no access to the produce.
Community forestry involves tree planting on village common lands, panchayat properties, and public waste spaces where local communities actively participate in management and retain rights to access forest produce. Asserting that locals are barred from utilizing community forest products is incorrect, as public benefit sharing and community management form the foundational principles of this social forestry component.

**20.** (B) Only II and III
Social forestry aims to generate non-farm rural employment, rehabilitate degraded wastelands, improve soil conservation, and satisfy local community demands for fuelwood, small timber, and fodder. Its focus centers on community welfare and ecological restoration outside state reserves, rather than serving as a raw material supply chain for large-scale heavy wood industries or commercial timber conglomerates.

**21.** (A) P-2, Q-1, R-4, S-3
Social forestry components target distinct land areas based on specific objectives. Farm forestry focuses on private agricultural lands where farmers cultivate trees. Community forestry utilizes village common lands and panchayat properties. Extension forestry targets public linear strips like roadsides, railway tracks, and canal banks. Recreation forestry emphasizes establishing urban green spaces, parks, and aesthetic belts for public recreation.

**22.** (D) Japan International Cooperation Agency (JICA)
Large-scale afforestation and eco-restoration projects in Rajasthan have historically received substantial funding and technical assistance from the Japan International Cooperation Agency. Prominent initiatives such as the Rajasthan Forestry and Biodiversity Project have utilized JICA aid to expand green canopy, conserve endemic flora and fauna, check desertification, and enhance rural livelihood opportunities across fragile ecosystems.

**23.** (B) Complete elimination of agriculture to maximize tree cover
Social forestry aims to complement agriculture rather than eliminate farming activities. The programme seeks to integrate tree growing with traditional crop production through farm forestry, enhance non-timber produce availability, empower local village panchayats in resource management, and diversify rural income streams. Replacing food crop cultivation with forest monocultures contradicts the foundational socio-economic principles of social forestry.

**24.** (C) 1990
Joint Forest Management was formally introduced across India in June 1990 when the Ministry of Environment and Forests issued explicit national guidelines to state governments. This policy framework enabled collaborative partnerships between state forest departments and local village communities for protecting, regenerating, and managing degraded forest lands in exchange for structured access to forest produce and revenues.

**25.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Joint Forest Management transformed traditional forestry by replacing exclusionary enforcement with community-based participatory management. Under this initiative, state forest departments partner with local forest-dependent villages to co-manage degraded forests. Local communities gain legal access to non-timber forest produce and revenue shares, motivating them to protect forest resources from illegal felling, encroachment, and forest fires effectively.

**26.** (A) Village Forest Protection and Management Committee (VFPMC)
Under the Joint Forest Management framework in Rajasthan, the primary executive body constituted at the village level is the Village Forest Protection and Management Committee. Comprising local village members and forest

NODIA

India for camel and goat populations due to their adaptability to arid climates. It holds second position nationwide in total buffalo numbers, while ranking fourth in overall sheep population, highlighting the state's pastoral prominence.

**45.** (C) Both Statement I and Statement II are correct.
Livestock rearing exhibits superior climate resilience compared to crop farming in dry regions. During severe drought conditions, standing agricultural crops dry up and fail completely, whereas pastoralists can migrate their mobile livestock herds (transhumance) toward areas with available fodder and water resources, ensuring household survival and maintaining steady rural economic income streams.

**46.** (C) Western border region (Jaisalmer, Barmer)
The Tharparkar cattle breed is predominantly distributed across the western border districts of Rajasthan, particularly Jaisalmer and Barmer. Extremely hardy and drought-tolerant, this dual-purpose dual-pigment indigenous breed thrives in extreme desert temperatures and sparse natural pastures, producing moderate-to-high milk yields while displaying high resistance to tropical diseases and prolonged heat stress.

**47.** (A) P-2, Q-1, R-4, S-3
Rajasthan's indigenous cattle breeds correlate with specific geographic zones. Rathi cattle are concentrated in Bikaner, Ganganagar, and Hanumangarh. Kankrej thrives across Jalore, Sirohi, and Barmer. Gir, locally termed Renda, is predominantly reared in Ajmer and Bhilwara districts. Malvi cattle are centered in southern Hadoti and Malwa border districts like Jhalawar and Pratapgarh.

**48.** (C) Jamnapari
Jamnapari is a well-known indigenous breed of goat, famous for its large size, majestic Roman nose, and high milk yield. In contrast, Chokla, Magra, and Pugal represent distinct indigenous breeds of sheep native to Rajasthan. Therefore, Jamnapari represents the odd option in this group due to its distinct livestock species categorization.

**49.** (A) I, II and III
Murrah is the premier buffalo breed in Rajasthan, originating from Haryana districts like Rohtak and Hisar. Celebrated for high milk yields with rich fat content, it is extensively reared across eastern and northern state districts. Buffaloes are milk and meat producers, making the assertion that Murrah is reared for wool production completely incorrect.

**50.** (D) Nagauri
Nagauri cattle are renowned across India for their exceptional draft capacity, agility, and muscular endurance. Native to Nagaur district, the bulls possess strong limbs and broad chests, making them uniquely suitable for intense agricultural plowing, heavy carting, and rapid farm transportation tasks in dry, sandy soils where mechanical tractors face operational limitations.

**51.** (A) Goat
Sirohi, Marwari, Barbari, and Jakhrana are prominent indigenous breeds of goats reared extensively across Rajasthan. Highly valued for dual-purpose meat and milk yields, these hardy small ruminants adapt remarkably well to arid terrain, sparse desert vegetation, and extreme heat, earning the goat its reputation as the "poor man's cow" in rural areas.

**52.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The Rathi cattle breed is widely known as the "Kamdhenu of Rajasthan" due to its outstanding milk productivity in harsh desert environments. Adapted to the north-western arid tracts, this milch breed produces high milk yields despite sparse forage and extreme temperatures, providing crucial economic stability to pastoral farming households in dry regions.

**53.** (A) First or Second
Rajasthan consistently occupies either the first or second position among Indian states in total annual milk production, according to official Basic Animal Husbandry Statistics. Supported by large cattle and buffalo populations, structured dairy cooperatives, and traditional pastoral practices, the state contributes over fourteen percent to India's total national milk output annually.

**54.** (B) 1977
The Rajasthan Cooperative Dairy Federation was established in 1977 as the apex body for implementing cooperative dairy development across the state. Registered under the Rajasthan Cooperative Societies Act, RCDF was created

Downloaded from www.pdf.tube

2009 as a state-wide mass afforestation initiative. The drive aimed to significantly increase tree canopy cover, enhance environmental awareness, involve local communities, panchayats, and non-governmental institutions in mass plantation efforts, and mitigate desertification impacts across urban and rural zones.

**36.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
The Harit Rajasthan initiative emphasized seedling survival rates rather than merely counting planted saplings. Historically, tree plantation drives in arid tracts suffered high seedling mortality due to harsh climatic conditions, inadequate water, and lack of post-plantation care. Prioritizing post-planting survival ensured that afforestation investments led to established green canopy across desert landscapes.

**37.** (A) Replacing native flora with exotic ornamental plants
Harit Rajasthan focuses on planting indigenous drought-resistant tree species well-adapted to local climatic conditions rather than replacing native flora with exotic ornamental plants. Exotic species often fail to thrive or consume excessive groundwater. The scheme prioritizes expanding green canopy, preventing soil erosion, halting desertification, and engaging local communities in long-term natural resource conservation.

**38.** (D) Distributing medicinal saplings to households for health awareness
The Ghar Ghar Aushadhi Yojana was launched by the Rajasthan Government to promote household-level health awareness and traditional herbal wellness. Under this state initiative, free saplings of important medicinal plants are distributed directly to families across the state, encouraging citizens to cultivate medicinal flora at home and integrate traditional remedies into daily preventive health routines.

**39.** (D) I, II and III
Under the Ghar Ghar Aushadhi Yojana, the Forest Department of Rajasthan distributed a standardized kit containing eight saplings of four primary medicinal plant species to households. These species included Tulsi, Giloy, Ashwagandha, and Kalmegh. Selected for their high therapeutic value, ease of cultivation, and immunity-boosting properties, all these plants were included in the scheme's distribution package.

**40.** (C) Improving biodiversity, securing livestock fodder, and maintaining ecological balance
Planting trees on Gram Panchayat common lands like Gochar and Oran strengthens rural environmental sustainability. These communal spaces support native biodiversity, supply green fodder and shade for livestock, prevent land encroachment, and maintain ecological equilibrium. Conserving community pastures ensures sustainable grazing resources for pastoral households without privatizing or diverting public lands for industrial commercial ventures.

**41.** (C) Between 45% to 50%
Animal husbandry plays a vital role in Rajasthan's rural economy, contributing approximately 45 to 50 percent of the total Gross State Value Added within the agriculture and allied sector at constant prices. Given the state's frequent droughts and arid geography, livestock rearing provides a critical, stable source of farm income alongside crop cultivation.

NODIA

**42.** (A) Its economic contribution is far lower than the state mining sector.
Animal husbandry generates substantial state revenue and supports rural livelihoods in Rajasthan, holding an economic weight far exceeding that of mining in rural income generation. It provides a reliable safety net against crop failure during droughts, generates continuous year-round employment, and ensures essential nutritional security through steady milk, dairy product, and meat supply.

**43.** (B) Rearing livestock alongside growing agricultural crops
In the context of Rajasthan's agricultural sector, mixed farming refers to the complementary practice of rearing livestock while simultaneously cultivating agricultural crops on the same farm holding. Crop residues provide essential feed and fodder for domestic animals, while livestock yields valuable organic manure for crop fields, creating a resilient socio-economic buffer against environmental risks.

**44.** (A) P-1, Q-1, R-3, S-2
According to the 20th Livestock Census, Rajasthan occupies leading national positions in livestock populations. The state ranks first in

**64.** (C) Hemorrhagic Septicemia (HS)
Hemorrhagic Septicemia is a severe bacterial disease caused by Pasteurella multocida, affecting cattle and buffaloes particularly during humid monsoon seasons. In contrast, Foot and Mouth Disease, Lumpy Skin Disease, and Peste des Petits Ruminants are highly contagious diseases caused by viral pathogens, making Hemorrhagic Septicemia distinct as a bacterial infection.

**65.** (B) Virus
Foot and Mouth Disease is a highly contagious disease affecting cloven-hoofed animals such as cattle, buffaloes, sheep, and goats. It is caused by an Aphthovirus belonging to the Picornaviridae family. The disease manifests through fever and blister-like lesions on the mouth, tongue, teats, and hooves, causing significant economic losses in dairy productivity.

**66.** (C) Both Statement I and Statement II are correct.
The Government of Rajasthan deployed Mobile Veterinary Units accessible via the centralized toll-free helpline number 1962. These specialized vehicles are fully equipped with veterinary diagnostic tools, essential medicines, and trained personnel to deliver door-step animal healthcare, emergency treatment, and preventive vaccination services directly to livestock rearers in distant rural villages.

**67.** (A) Jaipur
The State Disease Diagnostic Centre operates as the premier central diagnostic laboratory under the Animal Husbandry Department of Rajasthan, located in Jaipur. This state facility provides advanced disease surveillance, diagnostic testing, epidemiological investigation, and laboratory confirmation for infectious livestock diseases, guiding disease containment and preventive vaccination strategies state-wide.

**68.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Preventive vaccination against bacterial diseases like Hemorrhagic Septicemia and Black Quarter is systematically conducted prior to the monsoon season. High humidity, standing water, and fluctuating ambient temperatures during the rainy period accelerate bacterial pathogen proliferation and disease transmission among livestock, making pre-monsoon immunization essential for effective disease prevention across vulnerable herds.

**69.** (A) Sacred community groves dedicated to local deities where tree cutting is prohibited
In Rajasthan's traditional pasture management, an Oran represents a sacred community grove designated around local temples or dedicated to deities. Strict religious customs govern these areas, completely banning tree felling and wood cutting. Consequently, Orans preserve old-growth native flora, maintain micro-biodiversity, conserve local watersheds, and provide protected grazing spaces for community livestock.

**70.** (A) Only I and II
Fodder production in Rajasthan faces major structural challenges due to shrinking community pasture lands (Gochars) caused by human encroachment and high reliance on uncertain monsoon rainfall. Claiming an over-dominance of highly nutritious perennial grasses across every district is factually false, as feed deficits remain widespread in arid and semi-arid zones.

**71.** (B) Sewan
Sewan (Lasiurus sindicus) is a highly nutritious, drought-hardy perennial grass native to the hyper-arid Lathi series formation in Jaisalmer district. Thriving in extreme desert conditions with minimal rainfall, Sewan grass binds loose desert soil, prevents sand dune migration, and provides nutritious fodder for livestock, serving as an irreplaceable pastoral grazing resource.

**72.** (C) Producing trees and livestock forage on the same land to boost productivity.
Promoting silvopastoral systems in dry regions involves integrating multipurpose woody trees with perennial forage grasses and livestock grazing on the same land unit. Trees improve microclimate, bind soil, and offer leaf fodder, while underlying grasses provide continuous grazing pasture. This combination boosts total land productivity and prevents land degradation in arid tracts.

**73.** (A) II, IV, III, I
Continuous overgrazing degrades arid pasture ecosystems through a systematic ecological breakdown sequence. Dominant perennial climax grasses (Sewan, Dhaman) disappear first under heavy grazing pressure, replaced initially by less palatable annual grasses. Further overgrazing

Click Here to Buy book on Amazon

to organize milk procurement, process dairy products, provide technical inputs to cattle owners, and streamline marketing networks modeled on the Operation Flood pattern.

**55.** (A) Statement I is correct but Statement II is incorrect.
Dairy cooperative development in Rajasthan follows the three-tier Anand Pattern structure. In this framework, Primary Dairy Cooperative Societies function at the village level, District Milk Producers' Unions operate at the district level, and the Rajasthan Cooperative Dairy Federation serves at the state apex level. Claiming RCDF functions at the village level is factually incorrect.

**56.** (C) II, III, I
The three-tier dairy cooperative organizational hierarchy ascends from the grass-roots level to the state level. Primary Dairy Cooperative Societies form the foundational bottom tier at the village level. District Milk Producers' Cooperative Unions constitute the intermediate middle tier. The Rajasthan Cooperative Dairy Federation sits as the apex governing body at the top tier.

**57.** (D) Saras
Saras is the official flagship brand name under which the Rajasthan Cooperative Dairy Federation markets its processed liquid milk and diverse dairy products. Recognized state-wide for quality, Saras products include packaged milk, ghee, butter, paneer, and sweets, produced through an extensive network of district milk unions and village cooperative societies.

**58.** (A) Only I and II
The Rajasthan Cooperative Dairy Federation organizes milk procurement through affiliated district cooperative unions and operates cattle feed manufacturing plants to supply balanced nutrition to dairy farmers. However, RCDF operates within a competitive market framework and holds no legal authority or operational policy mandate to ban private milk vendors from selling dairy products.

**59.** (B) Verghese Kurien
Dr. Verghese Kurien, recognized as the "Father of the White Revolution" in India, spearheaded the transformational dairy movement that inspired Rajasthan's cooperative framework. Through Operation Flood and the establishment of the Anand cooperative model, he organized smallholder farmers, integrated dairy infrastructure, eliminated exploitative middlemen, and turned India into the world's largest milk producer.

**60.** (B) Ownership and control of production, processing, and marketing by producers themselves.
The remarkable success of the Anand Pattern cooperative model rests on democratic producer ownership across all operational stages. Farmers directly own and control milk procurement, industrial processing, and market distribution through a multi-tier cooperative network. This structural setup ensures maximum financial returns flow back to rural producers rather than intermediate dealers or private corporate entities.

**61.** (A) Operation Flood
Operation Flood was the landmark national dairy development initiative launched in 1970 by the National Dairy Development Board. It replicated the successful Anand cooperative model nationwide, transforming India from a milk-deficient nation into the world's leading milk producer. In Rajasthan, Operation Flood laid the foundation for the structured RCDF cooperative dairy network.

**62.** (A) I, II and III
The White Revolution organized milk procurement through cooperatives, eliminating exploitative middlemen, offering guaranteed prices to farmers, and empowering rural women through primary dairy society participation. It aimed to improve livestock productivity rather than drastically reducing overall livestock numbers, making the claim of livestock population reduction incorrect in this socio-economic context.

NODIA

**63.** (D) Anand Milk Union Limited
The acronym AMUL stands for Anand Milk Union Limited, a landmark cooperative venture established in Anand, Gujarat. Serving as the pioneer model for India's White Revolution, AMUL demonstrated how organizing rural dairy farmers into democratic cooperatives could transform milk production, modernize processing infrastructure, eliminate middlemen, and enhance rural economic self-reliance nationwide.

department representatives, this committee formulates micro-plans, oversees forest protection activities, regulates resource utilization, and manages profit-sharing distributions from regenerated forest tracts within community boundaries.

**27.** (B) Statement I is incorrect but Statement II is correct.
Joint Forest Management does not transfer land ownership rights to participating village communities, as state forest land remains government property. However, local communities receive legal user rights over non-timber forest produce and a designated share of net revenue derived from timber harvesting, rewarding their active involvement in forest protection, conservation, and micro-planning efforts.

**28.** (B) National Forest Policy, 1988
The National Forest Policy of 1988 marked a paradigm shift in Indian forestry by prioritizing environmental stability and ecological balance over commercial timber exploitation. Crucially, it recognized that forest protection is impossible without active participation from local forest-dependent communities, establishing the essential policy foundation for the subsequent introduction of Joint Forest Management guidelines across states.

**29.** (A) Overseas Economic Cooperation Fund (OECF), Japan
The Aravalli Afforestation Project, executed between 1992 and 2000, was a major environmental restoration scheme in Rajasthan funded by the Overseas Economic Cooperation Fund of Japan, which later merged into JICA. The project focused on reforesting degraded Aravalli hills, checking desert expansion eastward, improving soil moisture conservation, and restoring ecological stability across impacted mountain districts.

**30.** (B) Only III
The Rajasthan Forestry and Biodiversity Project is externally aided by the Japan International Cooperation Agency rather than being solely funded by the state government. It focuses on expanding forest cover, conserving biodiversity, promoting sustainable eco-tourism, and building sustainable livelihoods for local communities. Therefore, claiming that the project operates without external financial assistance is factually incorrect.

**31.** (D) To rejuvenate degraded pasture lands and ensure fodder supply in arid areas
The Maru Gochar Yojana was launched in Rajasthan specifically to address critical fodder shortages and pasture degradation in western desert regions. The scheme focuses on developing and restoring traditional community grazing lands, planting high-yielding perennial desert grasses, raising shade trees, and building soil conservation structures to ensure sustained livestock fodder availability during frequent drought spells.

**32.** (C) Smriti Van Yojana — Developing green spaces in memory of departed loved ones
The Smriti Van Yojana is an innovative forestry scheme in Rajasthan designed to create green memorial parks and urban forests where citizens plant trees in memory of their departed relatives. This initiative fosters emotional connections between communities and tree conservation, successfully enhancing urban green cover, protecting suburban land from encroachment, and raising public environmental awareness.

**33.** (B) Mitigating forest land diversion impacts through compensatory afforestation
Funds collected under the Compensatory Afforestation Fund Management and Planning Authority in Rajasthan are legally mandated for environmental mitigation. When forest land is diverted for non-forest industrial or developmental uses, CAMPA funds are utilized to raise compensatory afforestation plantations, regenerate degraded forests, protect wildlife habitats, and implement soil conservation initiatives across designated tracts.

**34.** (A) II, III, I
The Wildlife Protection Act was enacted by the Indian Parliament in 1972 to safeguard wild flora and fauna. Subsequently, the national Forest Conservation Act was passed in 1980 to regulate forest land diversion. Much later, Rajasthan formulated its comprehensive First State Forest Policy in 2010, establishing the correct chronological timeline as 1972, 1980, and 2010.

**35.** (B) 2009
The Harit Rajasthan campaign was launched by the State Government of Rajasthan in the year

Downloaded from www.pdf.tube

leads to colonization by unpalatable thorny weeds and shrubs, ultimately ending in bare soil and severe wind erosion.

**74.** (C) 2014
In June 2014, the Government of Rajasthan officially declared the camel as the State Animal of Rajasthan under the livestock category. This decision recognized the camel's profound cultural heritage, historical role in desert transport, and vital socio-economic importance, while initiating targeted legal measures to check declining camel populations across the state.

**75.** (A) P-3, Q-1, R-4, S-2
Rajasthan's camel breeds possess distinct physical traits and operational utilities. Bikaneri is a heavy draft breed recognized by a distinct depression on its forehead. Jaisalmeri is known for swiftness and used extensively by border security forces. Mewari adapts well to hilly terrain, displaying a characteristic pendulous lower lip. Gomath camels excel in riding.

**76.** (B) The population of camels in Rajasthan has seen a steep increase over the last two decades.
Contrary to the claim of a steep population increase, camel numbers in Rajasthan have experienced a continuous and sharp decline over recent decades. Rapid agricultural mechanization, expansion of paved road networks, loss of traditional grazing lands, and regulatory trade restrictions have significantly reduced the operational demand for camels in desert transport and farming.

**77.** (C) Both Statement I and Statement II are correct.
Camels hold immense cultural heritage value in Rajasthan. Usta art of Bikaner is a world-renowned traditional craft involving intricate gold embossed work executed on treated camel hide products. Additionally, creative camel shearing, hair-carving, and traditional leather ornamentation form major cultural attractions showcased during the annual international Bikaner Camel Festival.

**78.** (B) I, II and III
The steep decline in Rajasthan's camel population is driven by rapid farm mechanization, shrinking traditional grazing pastures, and strict statutory restrictions on inter-state camel transport. Avian flu is a viral disease affecting bird species and has had no operational link or impact regarding the historical population decline observed among desert camel herds.

**79.** (D) Bikaner
The National Research Centre on Camel is situated at Jorbeer near Bikaner city. Established under the Indian Council of Agricultural Research, this premier institution conducts comprehensive scientific research on camel health, selective breeding, physiological adaptation, camel milk utilization, and product diversification to promote sustainable camel conservation across arid regions.

**80.** (C) 40-45 percent
Rajasthan is the premier wool-producing state in India, contributing approximately 40 to 45 percent of the country's total raw wool output annually. The state's large sheep population, particularly breeds like Chokla, Magra, and Nali, supports a thriving carpet-wool manufacturing industry and provides critical livelihood support to pastoral communities in arid districts.

**81.** (B) Chokla
The Chokla sheep breed, native to the Shekhawati region of Rajasthan, is renowned for producing fine, high-quality fleece and is popularly dubbed the "Indian Merino". Though yielding lower fleece quantities compared to foreign breeds, its wool fibers exhibit superior crimp and soft texture, making it ideal for manufacturing high-grade carpets and textiles.

NODIA

**82.** (D) Surti
Surti is a prominent breed of buffalo originating from Gujarat, recognized for its medium size and sickle-shaped horns. In contrast, Nali, Pugal, and Magra represent indigenous breeds of sheep native to the arid and semi-arid regions of Rajasthan, making Surti the single buffalo breed that does not fit this sheep group classification.

**83.** (C) Only I and III
Goats are highly favored by marginal farmers because they survive on sparse scrub vegetation, require minimal initial financial capital, and offer rapid financial returns due to high prolificacy and short generation intervals. The assertion that goat rearing requires high initial capital investment is incorrect, as goats remain far cheaper to acquire than large ruminants.

entrepreneurship among smallholder farmers and pastoral rearers nationwide.

**104.** (C) Sub-Mission on Eradication of FMD and Brucellosis
The revamped National Livestock Mission focuses on entrepreneurship development across four primary sub-missions: Livestock and Poultry Breed Development, Feed and Fodder Development, Innovation and Extension, and Governance. Eradication of Foot and Mouth Disease and Brucellosis is executed under the separate National Animal Disease Control Programme rather than as an NLM sub-mission.

**105.** (A) II, I, IV, III
Establishing an entrepreneurship unit under the National Livestock Mission follows a structured procedural sequence. The applicant submits a Detailed Project Report online on the portal. Next, the State Level Executive Committee reviews and approves the proposal. Subsequently, physical infrastructure undergoes field verification by agencies, culminating in final subsidy disbursement through SIDBI or banks.

**106.** (A) To supply high-quality, disease-free germplasm locally, reducing distant dependency.
Establishing specialized livestock breeder farms under the National Livestock Mission aims to produce and distribute certified, disease-free parent stock and superior germplasm locally. Developing regional breeding hubs ensures that smallholder farmers obtain high-yielding sheep, goat, and poultry stock easily, reducing reliance on distant suppliers and enhancing rural farm enterprise profitability.

**107.** (B) It prohibits native grass cultivation and only subsidizes exotic fodder crops.
The feed and fodder sub-mission under the National Livestock Mission actively promotes native perennial fodder grasses alongside cultivated forage crops to address feed deficits. It supports fodder seed multiplication, silage making, and dense fodder block production. Suggesting that native grass cultivation is prohibited or excluded from scheme assistance is completely false.

**108.** (C) 50%
Under the entrepreneurship development component of the revamped National Livestock Mission, eligible individuals, private firms, and cooperatives receive a fifty percent capital subsidy from the central government. Provided for establishing sheep, goat, pig, or poultry breeding farms, this financial grant significantly lowers initial capital costs and promotes rural livestock enterprise growth.

**109.** (C) 2014
The Government of Rajasthan created a dedicated Directorate of Gopalan in the year 2014 to streamline cattle conservation, welfare, and dairy breed development. This specialized administrative department oversees statutory grants to registered Gaushalas, manages stray cattle rehabilitation programmes, promotes indigenous cattle conservation, and supports bio-gas initiatives utilizing bovine waste.

**110.** (C) 9 months
Under prevailing state policy guidelines in Rajasthan, financial maintenance grants (Anudan) are provided to eligible registered Gaushalas for a period of nine months in a year. This state grant assists non-governmental shelters in purchasing green fodder, dry roughage, cattle feed, and veterinary care for destitute, non-milch, and rescued indigenous cattle heads.

**111.** (D) To build shelters for destitute stray male cattle at the Panchayat Samiti level
The Nandishala Yojana was launched by the Directorate of Gopalan in Rajasthan specifically to establish dedicated shelters for destitute stray male cattle at the Panchayat Samiti level. By housing stray bulls and non-descript male cattle, the scheme prevents crop damage in agricultural fields, mitigates road accidents, and promotes organized bovine management.

**112.** (C) Both Statement I and Statement II are correct.
The Rajasthan Government provides targeted financial assistance to registered Gaushalas for setting up institutional biogas plants. Converting cow dung into biogas generates renewable energy for cooking and electricity generation, while producing rich organic slurry that serves as high-quality bio-fertilizer, enhancing environmental sanitation and financial sustainability within cattle shelters.

Click Here to Buy book on Flipkart

to SC, ST, and BPL livestock rearers compared to general category farmers. Subsidizing insurance premiums reduces financial barriers for vulnerable rural households, making risk protection affordable and preventing socio-economic devastation when insured livestock die unexpectedly from disease or natural disasters.

**95.** (D) It prohibits Pashu Mitras from charging any service fees.
The Pashu Mitra Yojana engages trained veterinary youth and unemployed graduates to deliver doorstep animal husbandry services across rural areas, bridging gaps in state veterinary coverage. Pashu Mitras receive designated honorariums or authorized user service fees for doorstep health interventions, making the assertion that service fees are strictly prohibited factually incorrect.

**96.** (C) A digital platform for farmers to manage livestock health and trade disease-free germplasm
The e-GOPALA mobile application serves as a comprehensive digital portal designed to assist livestock rearers in managing herd health, nutrition, and breeding. The platform enables farmers to buy and sell disease-free germplasm, locate artificial insemination technicians, track animal vaccination schedules, and receive direct expert guidance regarding balanced livestock feeding practices.

**97.** (B) To uniquely identify the insured animal and prevent fraudulent claims
Affixing a tamper-proof polyurethane tag to the ear of an insured animal provides a unique identification number linked directly to the insurance policy documentation. This systematic tagging establishes verifiable identity proof during veterinary inspections and mortality claims, preventing fraudulent claims, double insurance, or identity substitution during financial settlement procedures.

**98.** (D) Manual introduction of processed semen into the female reproductive tract for conception
Artificial Insemination in livestock refers to the veterinary technique of collecting semen from genetically superior male sires, processing and preserving it, and manually introducing it into the female reproductive tract at the appropriate stage of estrus. This method maximizes the utilization of elite breeding males to improve herd genetics efficiently.

**99.** (D) -196 °C
For long-term cryopreservation and maintenance of sperm viability, frozen livestock semen straws are stored submerged in liquid nitrogen containers at a temperature of minus 196 degrees Celsius. At this ultra-low cryo-temperature, metabolic activity within sperm cells halts entirely, allowing successful storage of elite genetic material for many years.

**100.** (C) A superior sire can be used to inseminate thousands of females.
A major advantage of Artificial Insemination in breed improvement is that semen collected from a single genetically superior sire can be diluted, frozen, and used to inseminate thousands of females across wide geographic regions. This dramatically accelerates genetic progress, controls sexually transmitted animal diseases, and eliminates the risk of maintaining dangerous bulls.

**101.** (A) To ensure calves are female, rapidly increasing the milch cattle population.
Sex-sorted semen technology utilizes advanced flow cytometry to separate X-chromosome bearing sperm from Y-chromosome sperm. Using X-sorted semen for artificial insemination ensures that over ninety percent of resulting offspring are female calves. This rapidly expands female milch cattle populations, enhances farm milk production, and minimizes unwanted stray male cattle generation.

**102.** (A) Statement I is correct but Statement II is incorrect.
Embryo Transfer Technology allows a high-quality donor female to produce multiple genetically superior offspring annually by transferring flushed embryos into recipient surrogate cows. However, ETT requires specialized laboratory equipment, expensive hormonal protocols, and expert technical skill, making it significantly more expensive and complex than standard artificial insemination at the field level.

**103.** (C) 2014-15
The National Livestock Mission was formally launched by the Government of India during the 2014-15 financial year. Implemented across states including Rajasthan, the mission was designed to ensure sustainable livestock sector growth, enhance fodder availability, improve breed quality, encourage credit access, and foster

Downloaded from www.pdf.tube

destroy eggs, and kill young chicks in the Desert National Park region, severely undermining state conservation efforts aimed at protecting this rare avian species.

**123.** (B) Grazing livestock in sanctuary core areas during dawn and dusk.
Grazing livestock in sanctuary core areas during dawn and dusk significantly increases predation risk because leopards are nocturnal and crepuscular hunters actively searching for prey during low-light hours. Effective conflict prevention involves building predator-proof night corrals, improving shed lighting, and using guard dogs rather than grazing herds during peak predator activity periods.

**124.** (B) National Bureau of Animal Genetic Resources (NBAGR)
The National Bureau of Animal Genetic Resources, situated in Karnal, Haryana, is the premier ICAR institute mandated with identifying, characterizing, evaluating, registering, and conserving indigenous livestock and poultry genetic resources across India. NBAGR maintains official national registries and coordinates conservation strategies for native animal breeds, including those of Rajasthan.

**125.** (A) Mewar (Udaipur, Dungarpur, Chittorgarh)
The Sonadi sheep breed is native to the Mewar region of southern Rajasthan, including Udaipur, Dungarpur, Rajsamand, and Chittorgarh districts. Characterized by long, broad ears that trail along the ground while grazing, Sonadi sheep yield coarse carpet wool and milk, adapting well to sub-humid hilly terrain and agricultural grazing land.

**126.** (C) Indefinite crossbreeding with exotic breeds best conserves pure indigenous traits.
Continuous and indiscriminate crossbreeding with exotic livestock breeds dilutes unique indigenous genetic traits, leading to the loss of native disease resistance and heat tolerance. Effective conservation relies on in-situ habitat protection and ex-situ cryopreservation of genetic material, making the claim that crossbreeding conserves pure indigenous traits factually incorrect.

**127.** (D) Providing financial incentives and breeding support to traditional pastoralists.
The most effective in-situ conservation strategy for endangered indigenous livestock breeds involves supporting traditional pastoral communities within their native ecosystems. Offering financial incentives, subsidized veterinary healthcare, selective purebred sires, and fodder security enables herders to maintain purebred herds economically, ensuring sustainable genetic preservation in natural habitats.

**128.** (C) Sam (Desert National Park), Jaisalmer
To save the critically endangered Great Indian Bustard (Godawan) from extinction, a specialized conservation breeding centre was established at Sam inside the Desert National Park in Jaisalmer district. This facility focuses on collecting wild eggs, artificial incubation, chick rearing, and building a captive founder population for eventual wild reintroduction.

**129.** (C) Both Statement I and Statement II are correct.
Indigenous cattle breeds like Tharparkar and Kankrej possess exceptional genetic traits, including high tolerance to extreme thermal stress, lower water requirements, and natural immunity against tropical tick-borne diseases. Conserving these resilient genetic traits is vital for ensuring long-term food security and sustainable livestock production under changing global climatic conditions.

**130.** (D) Rolling of Bidis (traditional cigarettes)
Tendu leaves, harvested from Diospyros melanoxylon trees, represent a commercially vital Non-Timber Forest Product in southern Rajasthan. Due to their unique pliable texture, heat resistance, and neutral burning flavor, these harvested leaves are used almost exclusively as wrapping material for rolling traditional Indian bidis, providing seasonal collection employment to forest-dwelling tribal communities.

NODIA

**131.** (A) RAJAS Sangh (Rajasthan Tribal Area Development Cooperative Federation)
In Rajasthan, the procurement and marketing of Minor Forest Produce under the Minimum Support Price scheme is primarily coordinated by RAJAS Sangh. This apex tribal cooperative federation organizes collection networks, pays fair procurement prices to tribal gatherers, and markets non-timber forest items, protecting vulnerable communities from exploitative private trade intermediaries.

**113.** (B) The Gaushala must exclusively house exotic crossbred cows.
To receive government maintenance grants in Rajasthan, Gaushalas must register under the Rajasthan Goshala Act, house a minimum required number of cattle, and possess adequate land infrastructure. Grants specifically target indigenous cattle welfare, making any requirement to exclusively house exotic crossbred cows factually incorrect and contrary to state conservation policies.

**114.** (D) Transhumance / Nomadic pastoralism
Transhumance or nomadic pastoralism describes the seasonal migration of pastoralists and their livestock herds between fixed geographical areas. In Rajasthan, pastoral communities move herds from dry western desert regions toward water-rich regions of Madhya Pradesh or Gujarat during severe summer dry periods, returning to home villages after the arrival of monsoon rains.

**115.** (A) Rearing multi-species herds to optimize the use of sparse vegetation.
A defining feature of desert animal husbandry in Rajasthan is maintaining multi-species livestock herds consisting of cattle, sheep, goats, and camels. Different livestock species utilize distinct vegetative layers, from ground grasses to tree canopies, optimizing natural forage use across sparse desert ranges while mitigating risk against species-specific disease outbreaks.

**116.** (C) Sheep, Goats, and Camels
The hyper-arid western districts of Rajasthan contain the state's highest concentration of sheep, goats, and camels. These animals possess specialized physiological adaptations, including efficient water conservation mechanisms, high drought resistance, and the ability to feed on thorny xerophytic vegetation, making them uniquely suited for survival across open dryland pastures.

**117.** (A) It ensures that if a disease strikes one species, the farmer still has other species to rely on, thus acting as a risk-mitigation strategy.
Maintaining multi-species livestock herds serves as a crucial socio-economic risk mitigation strategy for desert pastoralists. Because different livestock species exhibit varying susceptibility to specific diseases and environmental stresses, maintaining mixed herds ensures that a single disease outbreak or drought event does not completely eliminate a household's livestock assets and livelihood.

**118.** (D) Mangrove (Rhizophora)
Mangrove species such as Rhizophora are specialized halophytic plants confined strictly to coastal intertidal wetlands and muddy estuarine zones. In contrast, Khejri, Bordi, and Ardu represent inland drought-resistant trees and shrubs heavily utilized for livestock leaf fodder in the dry arid animal husbandry systems of Rajasthan, making Mangrove the odd option.

**119.** (B) Foot and Mouth Disease (FMD)
Foot and Mouth Disease is a highly contagious viral infection that easily transmits between domestic livestock and wild ungulates like deer, blackbucks, and blue bulls when sharing overlapping forest grazing pastures. Cross-species transmission occurs through direct contact or contaminated forage and water sources, posing severe disease risks to protected wildlife populations.

**120.** (C) Financial compensation to owners for livestock lost to wild predators.
To mitigate wildlife-livestock conflict and prevent retaliatory killing of wild carnivores like leopards and tigers, the Rajasthan Forest Department provides direct ex-gratia financial compensation to livestock owners when domestic animals are killed by predators. Prompt financial relief reduces rural hostility toward wildlife and fosters community co-existence around reserve boundaries.

**121.** (D) Improving forest prey base and habitat so predators stay within reserves.
The most sustainable long-term ecological strategy to reduce livestock predation by wild carnivores involves restoring degraded forest habitats and rebuilding natural herbivorous prey populations within reserve boundaries. When natural wild prey like spotted deer and wild boar are abundant inside forests, large predators rarely venture into surrounding villages for livestock.

**122.** (C) Both Statement I and Statement II are correct.
Feral dogs accompanying pastoral herds in desert ecosystems pose a severe extinction threat to the critically endangered Great Indian Bustard. Free-roaming dogs raid ground nests,

Click Here to Buy book on Amazon

(C) A large community well constructed near an embankment or river bank
(D) A long earthen embankment constructed across the natural slope of a hill

**20.** Which modern technology is being highly promoted by the Rajasthan government in regions like the Narmada Canal area to ensure efficient water management?
(A) Conventional surface flood irrigation methods
(B) Deep tube well excavation and groundwater extraction
(C) Drip and sprinkler irrigation systems
(D) Brackish groundwater desalination plants

**21.** Which non-governmental organization, led by Rajendra Singh, is famous for reviving traditional water conservation structures like Johads in Rajasthan?
(A) Tarun Bharat Sangh
(B) Narmada Bachao Andolan
(C) Barefoot College
(D) Jal Bhagirathi Foundation

**22.** Match the traditional water conservation structures in List I with their prominent regions/ features in List II:
**List I: Water Conservation Structures**
P. Khadin
Q. Bawdi
R. Tanka
S. Jhalra
**List II: Regions/Features**
1. Stepwells known for architectural beauty, common in Bundi
2. Rectangular stepwells often found in Jodhpur, meant for community use
3. Traditional runoff farming system prominent in Jaisalmer
4. Underground rainwater storage common in Thar desert households
(A) P-3, Q-1, R-4, S-2
(B) P-4, Q-2, R-3, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-1, Q-3, R-4, S-2

**23.** The Mukhya Mantri Jal Swavlamban Abhiyan (MJSA) aims to make villages self-reliant in water through:
(A) Connecting all seasonal village ponds directly to major perennial rivers
(B) Restoring local water bodies using scientific watershed planning
(C) Distributing free packaged drinking water across all drought-prone rural districts
(D) Imposing a complete ban on all agricultural activities during the summer season

**24.** Which technology system is used at the Bisalpur Dam in Rajasthan for the centralized monitoring and control of water distribution?
(A) RADAR
(B) SONAR
(C) SCADA
(D) LIDAR

**25.** What is the name of the unified state-wide GIS platform launched by the Rajasthan government to support e-governance and decision-making?
(A) RajMegh
(B) RajNet
(C) Bhuvan-Raj
(D) RajDharaa

**26.** Which of the following is an application of Remote Sensing technology extensively used in Rajasthan?
(A) Mapping and monitoring desertification and land degradation
(B) Monitoring and controlling the operational temperature of industrial furnaces
(C) Enhancing the speed and bandwidth of optical fiber broadband internet in rural areas
(D) Providing automated real-time translation and interpretation of local regional dialects

**27.** The National Remote Sensing Centre (NRSC) provides satellite imagery to the State Remote Sensing Application Centre (SRSAC) primarily from which series of Indian satellites?
(A) INSAT (Indian National Satellite System)
(B) IRS (Indian Remote Sensing)
(C) GSAT (Geo-synchronous Satellite)
(D) ASTROSAT (Space Astronomy Observatory)

**28.** Consider the following statements regarding the application of GIS in Rajasthan:
I. It is used in urban planning to create 3D models of Smart Cities.
II. It helps in routing and tracking ambulances under the emergency response system.
III. It completely replaces the need for ground-level cadastral surveys in revenue matters.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only

NODIA

**132.** (C) Commercial Teak Wood (Timber)
Non-Timber Forest Products comprise all biological materials derived from forests excluding commercial industrial timber. Major NTFPs include wild flowers, seeds, honey, plant gums, resins, and medicinal herbs. Commercial teak wood represents heavy structural timber extracted from tree trunks, placing it legally outside the classification of minor or non-timber forest produce.

**133.** (A) Katha — Acacia catechu (Khair)
Katha is a valuable vegetable extract derived by boiling the heartwood of the Khair tree (Acacia catechu), found abundantly in the dry deciduous forests of southern Rajasthan. Widely used in pan preparations, traditional medicines, and leather tanning industries, Katha extraction represents a major traditional forest-based enterprise in the state.

**134.** (D) Kathodi
The traditional extraction of Katha from Khair trees in southern Rajasthan is historically carried out by the Kathodi tribal community. Traditionally skilled in heartwood processing using specialized earthen pot boiling techniques, this vulnerable tribal group derives its distinct cultural identity and forest-based livelihood from this specialized non-timber forest produce activity.

**135.** (B) Flowers provide food and traditional liquor, while seeds yield edible oil.
The Mahua tree is indispensable to tribal livelihoods in southern Rajasthan due to its multi-purpose utility. Its sweet fleshy flowers are consumed directly as food or fermented into traditional beverages, while its nutrient-rich seeds yield commercial oil used for cooking and lighting. Consequently, Mahua trees are carefully protected across tribal forest belts.

**136.** (C) Agrosilvopastoral system
An agrosilvopastoral system is an integrated land-use management model that deliberately combines agricultural crop cultivation, woody forest trees, and livestock rearing on the same land unit. This multi-component arrangement optimizes ecological nutrient recycling, maximizes total farm productivity, diversifies household income, and enhances land resilience against climate variability and drought risks.

**137.** (D) Trees feed livestock; livestock manures crops and trees; crops feed humans and livestock.
An integrated agriculture-forestry-animal husbandry model achieves ecological synergy through closed-loop nutrient cycling. Multipurpose trees supply leaf fodder and shade for livestock; domestic animals produce organic manure that enriches topsoil for agricultural crops and trees; and harvested crop residues feed humans and farm animals, creating a self-sustaining and resilient production system.

**138.** (C) Both Statement I and Statement II are correct.
Integrating agriculture, forestry, and animal husbandry reduces total livelihood risk for dryland farmers. During severe drought conditions when rainfed agricultural crops fail completely, farmers maintain income and nutritional sustenance through deep-rooted drought-hardy trees supplying fruit and fodder, alongside resilient livestock yielding daily milk, wool, and secondary farm revenue.

**139.** (B) Deep roots recycle leached nutrients while the canopy acts as a protective windbreak.
Incorporating multipurpose trees like Khejri into agricultural fields yields key ecological benefits in arid regions. Deep taproot systems draw water and minerals from lower soil strata, enriching topsoil with fallen leaf litter. Simultaneously, the tree canopy serves as an effective windbreak, reducing surface wind erosion and conserving subsoil moisture for crops.

**140.** (B) Complete elimination of the need for human labor on the farm
Adopting an integrated farming model offers major economic advantages, including year-round income diversification, optimal waste utilization, and reduced dependence on costly chemical fertilizers. However, managing diverse components—crops, tree crops, and livestock—requires continuous manual management, making the complete elimination of human labor on the farm an entirely false claim.

www.nodia.in

Downloaded from www.pdf.tube

**84.** (C) Avikanagar, Malpura (Tonk)
The Central Sheep and Wool Research Institute is an apex national research organization under ICAR, located at Avikanagar in Tonk district, Rajasthan. Established in 1962, CSWRI conducts basic and applied research on sheep breeding, wool processing, nutritional management, disease control, and meat production to enhance small ruminant productivity across dryland ecosystems.

**85.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Sheep rearing is heavily concentrated in Rajasthan's western arid districts due to favorable climatic adaptations. Dry environmental conditions suppress humid-climate internal parasites and foot infections. Furthermore, sheep possess exceptional physiological ability to graze on sparse desert vegetation, short grasses, and thorny bushes, making small ruminant pastoralism highly viable across dry tracts.

**86.** (D) Parbatsar (Didwana-Kuchaman)
The famous Shri Veer Teja Ji Animal Fair is organized annually at Parbatsar, located in the present Didwana-Kuchaman district. Held during the Hindu month of Bhadrapada, it stands among Rajasthan's largest livestock fairs in economic revenue, serving as a historic trading center for renowned Nagauri draft cattle and local livestock.

**87.** (B) Chandrabhaga Animal Fair — Jhalawar
The Chandrabhaga Animal Fair is held annually at Jhalrapatan in Jhalawar district along the banks of the Chandrabhaga River during the month of Kartik. This fair is celebrated for trading Malvi breed cattle and local livestock, attracting pastoral buyers, farmers, and traders from Rajasthan and neighboring Madhya Pradesh border regions.

**88.** (B) I, III, II
According to the traditional Hindu lunar calendar starting from Chaitra month, the Mallinath Animal Fair at Tilwara occurs first during Chaitra. The Gogamedi Animal Fair at Nohar follows later during the monsoon month of Bhadrapada. Finally, the famous Pushkar Animal Fair takes place in the month of Kartik, establishing the correct chronological sequence as I, III, II.

**89.** (D) Luni
The historical Mallinath Animal Fair is organized annually at Tilwara along the sandy beds of the Luni River in Balotra district. Held in the Hindu month of Chaitra, this ancient pastoral congregation serves as a major trading platform for hardy desert livestock breeds, notably Tharparkar cattle, Kankrej cattle, and Malani horses.

**90.** (A) Shri Gomati Sagar Animal Fair (Jhalrapatan)
The Shri Gomati Sagar Animal Fair held at Jhalrapatan in Jhalawar district is predominantly famous for the purchase and sale of Malvi cattle native to the Hadoti and Malwa regions. In contrast, the Ramdev, Baldev, and Veer Teja Ji fairs in Nagaur district are specifically renowned for trading Nagauri draft cattle.

**91.** (C) Kartik
The world-famous Pushkar Fair takes place annually during the Hindu lunar month of Kartik, culminating on Kartik Purnima in Ajmer district. Combining vibrant religious festivities with a massive livestock market, the fair draws global tourists and pastoral communities for large-scale trading of camels, horses, indigenous cattle breeds, and domestic livestock.

**92.** (C) ₹40,000
Under the Mukhyamantri Kamdhenu Pashubima Yojana introduced by the Rajasthan Government, financial insurance coverage is provided up to a maximum limit of forty thousand rupees per milch animal. Designed to safeguard livestock owners against severe financial distress caused by sudden cattle mortality, the scheme covers up to two milch animals per household.

NODIA

**93.** (A) I, II and IV
The Mukhyamantri Kamdhenu Pashubima Yojana provides free insurance for up to two milch cattle per family, protecting livestock owners against financial loss from animal mortality, especially after outbreaks like Lumpy Skin Disease. The policy covers indigenous milch breeds alongside exotic cattle, making the claim that indigenous cattle are excluded factually false.

**94.** (C) Both Statement I and Statement II are correct.
In government-sponsored livestock insurance schemes, higher premium subsidies are allocated

mining
(D) Standardization of windbreak and shelterbelt plantation techniques

**10.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Solar power generation in western Rajasthan is highly viable.
**Reason (R):** The region receives high solar insolation and has vast tracts of barren land.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**11.** Bhadla Solar Park, one of the largest solar parks in the world, is situated in which district of Rajasthan?
(A) Bikaner
(B) Jodhpur
(C) Jaisalmer
(D) Barmer

**12.** What is the approximate total installed capacity of the Bhadla Solar Park upon the completion of all its phases?
(A) 1000 MW
(B) 1500 MW
(C) 2245 MW
(D) 3500 MW

**13.** Which nodal agency is primarily responsible for the promotion and development of non-conventional energy sources in Rajasthan?
(A) Rajasthan Renewable Energy Corporation Limited (RRECL)
(B) Rajasthan State Electricity Board (RSEB)
(C) Rajasthan Solar Park Development Company
(D) Department of Mines and Geology

**14.** The first wind power project of Rajasthan was commissioned in 1999 at which of the following locations?
(A) Devgarh, Pratapgarh
(B) Bithdi, Jodhpur
(C) Amarsagar, Jaisalmer
(D) Phalodi, Jodhpur

**15.** Consider the following statements regarding the Rajasthan IT and Start-up Policy:
I. The iStart Rajasthan platform offers single-window clearance for start-ups.
II. The policy provides sustenance allowance and seed funding to recognized start-ups.
III. Bhamashah Techno Hub has been established in Udaipur to incubate start-ups.
IV. QRate is an assessment program to help start-ups improve their business plans.
Which of the above statements are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

**16.** What is the primary purpose of the 'Rajiv Gandhi Centre of Advanced Technology' (R-CAT) established in Jaipur?
(A) To provide free specialized medical consultations via telemedicine
(B) To research and preserve traditional regional agricultural practices
(C) To train youth in advanced information technology domains
(D) To act as a state hub for space research and satellite launching

**17.** Which of the following portals was launched by the Rajasthan government to bring transparency and proactively provide information to citizens under the RTI Act?
(A) RajKaj Portal
(B) Jan Soochna Portal
(C) RajDharaa
(D) E-Mitra Plus

**18.** In the context of traditional water management in Rajasthan, what is a 'Johad'?
(A) A deep stepwell constructed exclusively for drinking water storage
(B) A wooden canal structure used to divert mountain river water
(C) An underground storage tank built to collect rainwater in urban areas
(D) An earthen check dam constructed to capture surface runoff

**19.** A traditional 'Tanka' in western Rajasthan is best described as:
(A) A covered underground cistern built to harvest rainwater
(B) An open natural lake utilized for seasonal irrigation and livestock

Click Here to Buy book on Flipkart

# CHAPTER 15

# Science and Technology Development in Rajasthan

**1.** Which of the following is the primary objective of the Rajasthan Science and Technology Policy?
(A) To promote scientific research exclusively in private universities
(B) To integrate science and technology into state development programs and foster innovation
(C) To restrict technological research to the agricultural and mining sectors
(D) To centralize all scientific funding under the central government ministries

**2.** The Department of Science and Technology (DST) in Rajasthan was established in which of the following years?
(A) 1971
(B) 1983
(C) 1995
(D) 2002

**3.** Which of the following institutions operates the State Remote Sensing Application Centre (SRSAC) in Rajasthan?
(A) Department of Science and Technology, Rajasthan
(B) Indian Space Research Organisation (ISRO)
(C) Ministry of Earth Sciences, Government of India
(D) Geological Survey of India

**4.** What is the primary focus of the Patent Information Centre (PIC) established by DST Rajasthan?
(A) To issue manufacturing licenses to industrial units
(B) To regulate foreign direct investment in technology
(C) To create awareness and facilitate the filing of Intellectual Property Rights (IPR)
(D) To provide direct financial loans to farmers for modern machinery

NODIA

**5.** The Birla Institute of Technology and Science (BITS), a pioneer in technical education in Rajasthan, is located in which district?
(A) Jhunjhunu
(B) Jaipur
(C) Jodhpur
(D) Sikar

**6** Malaviya National Institute of Technology (MNIT) in Jaipur was originally established in 1963 under which name?
(A) Jaipur Institute of Technology
(B) Rajasthan College of Engineering
(C) Central Institute of Technology Rajasthan
(D) Malaviya Regional Engineering College

**7.** The Central Arid Zone Research Institute (CAZRI) is located in which city of Rajasthan?
(A) Bikaner
(B) Jodhpur
(C) Jaisalmer
(D) Barmer

**8.** Consider the following statements regarding CAZRI:
I. It was elevated to the status of a full-fledged institute in 1959.
II. It operates under the Indian Council of Agricultural Research (ICAR).
III. Its primary objective is to study and manage coastal soil erosion.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**9.** Which of the following is a major technological contribution of CAZRI to desert agriculture?
(A) Development of high-yielding rice varieties suitable for deep water
(B) Introduction of genetically modified cotton in non-irrigated zones
(C) Development of heavy machinery for deep

(C) I and III only
(D) I, II and III

**29.** Which scheme utilizes satellite remote sensing to estimate crop yields and settle crop insurance claims in Rajasthan?
(A) FASAL
(B) VAMBAY
(C) MNREGA
(D) PM-KISAN

**30.** Which mobile exhibition is periodically organized in collaboration with the Government of India to popularize science among students in remote areas of Rajasthan?
(A) Gyan Rath
(B) Tech Yatra
(C) Vigyan Rail
(D) Vigyan Darshan

**31.** The Birla Science Museum, known for showcasing technological achievements and scientific models, is located at:
(A) Jaipur
(B) Kota
(C) Udaipur
(D) Pilani

**32.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Rajasthan government has established regional science centres and science parks in multiple districts.
**Reason (R):** There is a need to develop a scientific temper and eliminate superstitious beliefs among the masses.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**33.** On which day is National Science Day celebrated annually by the DST Rajasthan to commemorate the discovery of the Raman Effect?
(A) 28th February
(B) 11th May
(C) 5th June
(D) 15th October

**34.** To promote science at the school level, the DST Rajasthan supports the establishment of which clubs?
(A) Eco-Vigyan Clubs
(B) Bal-Gyan Clubs
(C) Techno-Rath Clubs
(D) Vigyan Mitra Clubs

**35.** Choose the correct sequence of the following solar power installations in Rajasthan in descending order of their total installed capacity:
(A) Bhadla Solar Park → Pavagada Solar Park → Nokh Solar Park → Phalodi Solar Park
(B) Bhadla Solar Park → Nokh Solar Park → Phalodi Solar Park → Rawatbhata Solar Park
(C) Nokh Solar Park → Bhadla Solar Park → Phalodi Solar Park → Amarsagar Solar Park
(D) Bhadla Solar Park → Phalodi Solar Park → Nokh Solar Park → Bikaner Solar Park

NODIA

**36.** Which of the following is NOT an objective of the Rajasthan Biotechnology Policy 2015?
(A) To establish bio-informatics centres of excellence
(B) To promote tissue culture for improved agricultural yields
(C) To completely ban the use of bio-fertilizers in the state
(D) To encourage research in medicinal and aromatic plants of the desert

**37.** In the context of mineral-based technology in Rajasthan, what is the primary purpose of 'beneficiation' applied to low-grade ores?
(A) To upgrade ore quality by removing gangue before smelting
(B) To permanently bury unprocessed low-grade ore back into underground mines
(C) To convert raw extracted ore directly into industrial finished metal sheets
(D) To continuously measure and record the radioactive emissions of extracted ore

**38.** Consider the following statements about mineral and biotech advancements in Rajasthan:
I. Hindustan Zinc Limited utilizes advanced hydrometallurgical technology for zinc extraction.
II. Jatropha curcas is promoted as a biofuel crop in the wasteland areas of Rajasthan.
III. Marble slurry, a waste product, is currently legally banned from being used in any construction material.

(D) High-definition live streaming of state legislative assembly sessions

**117.** Which technology is being utilized in Rajasthan to resolve the problem of marble slurry waste generated by the cutting industries in places like Kishangarh?
(A) Manufacturing tiles, synthetic marble, and road construction materials
(B) Injecting liquid slurry waste deep into natural geological fault lines
(C) Converting mineral slurry directly into high-efficiency combustible fuel
(D) Pumping slurry waste into dried seasonal riverbeds to retain subsoil moisture

**118.** The 'Lignite Gasification' technology is highly relevant to which region of Rajasthan due to its mineral deposits?
(A) Udaipur-Rajsamand belt
(B) Jaipur-Alwar belt
(C) Kota-Bundi belt
(D) Barmer-Bikaner belt

**119.** A traditional 'Khadin' system, primarily used by the Paliwal Brahmins of Jaisalmer, relies on which scientific principle?
(A) Utilizing capillary action mechanisms in deep sandy desert soils
(B) Capturing surface runoff to retain soil moisture for rabi crops
(C) Large-scale desalination of saline groundwater using solar thermal heat
(D) Deep drilling and boring into ancient fossil water underground aquifers

**120.** Which technology-based portal is used by the state's Health Department for maintaining electronic health records and tracking the health of pregnant women and children?
(A) Raj-HealthNet (State Health Network Portal)
(B) Ayushman-Raj (Integrated Health Management System)
(C) PCTS (Pregnancy and Child Tracking System)
(D) e-Sanjeevani (National Teleconsultation Service)

**121.** The 'National Research Centre on Seed Spices' (NRCSS), focusing on technological improvement in spices like cumin and coriander, is located at:
(A) Jodhpur
(B) Kota
(C) Bikaner
(D) Ajmer (Tabiji)

**122.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Rajasthan Start-up Policy has specific provisions to encourage women-led start-ups.
**Reason (R):** Enhancing gender inclusivity in the technology and entrepreneurial ecosystem is a key objective of the state's IT department.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**123.** The 'iStart School & Rural Innovation Challenge' encourages students to:
(A) Memorize complex computer programming languages and software algorithms
(B) Identify local problems and build technology-driven solutions
(C) Compete in state-level multiplayer e-sports tournaments for cash prizes
(D) Temporarily abandon formal education to start full-time private businesses

**124.** Which of the following is NOT a recognized Science Park in Rajasthan?
(A) Science Park, Jaipur
(B) Science Park, Pushkar
(C) Science Park, Jhalawar
(D) Science Park, Nawalgarh

**125.** The establishment of 'Custom Hiring Centres' (CHCs) in Rajasthan utilizes digital platforms to provide what service?
(A) Renting advanced agricultural machinery and drones to farmers
(B) Hiring specialized software developers for state government projects
(C) Renting government fleet vehicles for public transportation routes
(D) Booking public community centers and private wedding venues online

**126.** What is the main objective of the Rajasthan Government's 'RajNet' project?
(A) To provide free high-speed wireless internet

Downloaded from www.pdf.tube

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

**49.** Space technology and geographic information systems (GIS) are heavily used in Rajasthan to map potential zones for which critical subsurface resource?
(A) Natural rubber
(B) Groundwater
(C) Diamond pipes
(D) Coal bed methane

**50.** What is the full form of 'SMILE', a digital education initiative launched by the Rajasthan Government during the COVID-19 pandemic?
(A) Student Management for Interactive Learning Environments
(B) State Mission for Inclusive Learning and Education
(C) School Mentorship and Innovative Learning Engine
(D) Social Media Interface for Learning Engagement

**51.** Which digital initiative in Rajasthan aims to bridge the digital divide by providing personalized adaptive learning to students via tablets?
(A) Mission Buniyaad
(B) e-Kaksha
(C) Shala Darpan
(D) Gyan Vani

**52.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Tele-medicine networks connecting remote rural health centres to super-speciality hospitals are crucial for Rajasthan.
**Reason (R):** Rajasthan has a highly dense population distributed evenly across a small geographical area.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**53.** The 'e-Kaksha' project, offering free digital education content for government school students in Rajasthan, was developed in partnership with which corporate entity under their CSR initiative?
(A) Vedanta (Cairn Oil & Gas)
(B) Reliance Foundation
(C) Tata Trusts
(D) Infosys Foundation

**54.** What is the purpose of the 'Shala Darpan' portal maintained by the Rajasthan government?
(A) It is an online agricultural marketplace enabling state farmers to sell produce directly.
(B) It is a dedicated grievance redressal portal designed exclusively for healthcare workers.
(C) It is a real-time mobile application for tracking government public transport buses.
(D) It is a portal for government school administration and tracking student progress.

**55.** Consider the following statements about digital education in Rajasthan:
I. DIKSHA is a national portal whose state-specific educational content is utilized by Rajasthan.
II. Vidya Samiksha Kendra (VSK) is established to monitor real-time data of schools and students.
III. The state has achieved 100% replacement of physical textbooks with digital tablets in all primary schools.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**56.** Which of the following is the highest state-level scientific award given by DST Rajasthan to recognize outstanding contributions to Science and Technology?
(A) Maharana Pratap Vigyan Samman
(B) Rajasthan Ratna
(C) Rajasthan Vigyan Puraskar
(D) Bhamashah Vigyan Award

**57.** The 'INSPIRE' (Innovation in Science Pursuit for Inspired Research) scheme, executed in Rajasthan schools, is primarily funded by:
(A) Ministry of Human Resource Development, Government of India
(B) Department of Information Technology, Government of Rajasthan
(C) NITI Aayog (National Institution for Transforming India)
(D) Department of Science & Technology, GoI

NODIA

**78.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The Jan Soochna Portal eliminates the need for citizens to file formal RTI applications for many routine government services.
**Reason (R):** The portal provides proactive disclosure of information related to multiple government schemes in a single place.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**79.** The 'FinTech Park' being developed to attract IT and financial technology companies to Rajasthan is located in which city?
(A) Udaipur
(B) Jodhpur
(C) Alwar
(D) Jaipur

**80.** To boost the innovation ecosystem among school and college students, DST Rajasthan conducts which of the following events annually?
(A) Annual Rajasthan Start-up Fest
(B) Annual Desert Tech Conclave
(C) State Level Science Fairs
(D) Annual Rural IT Hackathon

**81.** The Central Sheep and Wool Research Institute (CSWRI), a premier technology institute for animal husbandry in Rajasthan, is located at:
(A) Fatehpur (Sikar)
(B) Avikanagar (Malpura)
(C) Suratgarh (Sri Ganganagar)
(D) Vallabhnagar (Udaipur)

**82.** Consider the following statements regarding the role of the State Innovation Council in Rajasthan:
I. It aims to foster a culture of innovation in educational institutions.
II. It identifies and supports grass-roots innovators.
III. It acts as the final regulatory authority for foreign direct investment in the state.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**83.** The technology of using 'SCADA' in Rajasthan is most prominently associated with which sector?
(A) Water supply projects like Bisalpur Dam
(B) Traffic signal management across major rural highway intersections
(C) Monitoring of individual residential solar rooftop energy panels
(D) Electronic automated ticketing systems of state roadways buses

**84.** Which state-level agency is responsible for establishing Science Parks across various districts of Rajasthan to popularize science?
(A) Department of Information Technology and Communication (DoIT&C)
(B) Rajasthan State Industrial Development and Investment Corporation (RIICO)
(C) Department of Science and Technology (DST)
(D) Board of Secondary Education Rajasthan (BSER)

**85.** Arrange the following steps of a typical start-up incubation process in the iStart Rajasthan program in chronological order:
I. Disbursement of sustenance allowance or seed funding
II. Registration on the iStart portal
III. QRate assessment and rating
IV. Pitching to the state-level committee for funding approval
(A) II, III, IV, I
(B) II, IV, III, I
(C) I, II, III, IV
(D) III, II, I, IV

**86.** Which technology is primarily used in Rajasthan for real-time monitoring of afforestation drives and forest cover changes?
(A) Seismography
(B) Radio Frequency Identification (RFID)
(C) Blockchain
(D) Remote Sensing and GIS

**87.** Under the PM-KUSUM scheme heavily implemented in Rajasthan, what is the core technological intervention provided to farmers?
(A) Providing heavily subsidized agricultural tractors and tillers to farmers
(B) Setting up solar agriculture pumps and

Click Here to Buy book on Amazon

to optimize fertilizer use.

Which of the above statements are correct?

(A) I, II and IV
(B) II, III and IV
(C) I, III and IV
(D) I, II and III

**69.** The Defence Laboratory Jodhpur (DLJ), a prominent R&D centre in Rajasthan, functions under which national organization?

(A) Defence Research and Development Organisation
(B) Indian Space Research Organisation (ISRO)
(C) Hindustan Aeronautics Limited (HAL)
(D) Council of Scientific and Industrial Research (CSIR)

**70.** Which of the following is a major area of research at the Defence Laboratory Jodhpur (DLJ)?

(A) Development and testing of nuclear-powered submarines and vessels
(B) Advanced design and engineering of jet engines for fighter aircraft
(C) Manufacturing and precision testing of heavy field artillery guns
(D) Desert warfare technologies, camouflage, and water purification

**71.** The Rajasthan government's 'Aerospace and Defence Manufacturing Policy' primarily aims to:

(A) Establish and maintain an independent state-owned paramilitary military force
(B) Attract investment and build MSME clusters for defence manufacturing
(C) Export raw mineral resources directly to international foreign defence companies
(D) Build and operate private orbital launch pads for commercial space satellites

**72.** Match the scientific institutions in Rajasthan in List I with their primary domain of research in List II:

**List I: Scientific Institution**

P. CEERI (Pilani)
Q. AFRI (Jodhpur)
R. NRCC (Bikaner)
S. RARI (Durgapura)

**List II: Domain of Research**

1. Forestry and ecology in arid regions
2. Electronics Engineering and Semiconductor research
3. Crop improvement and agricultural research
4. Camel health and breeding

(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

**73.** Which scheme is actively promoted by the DST to assist women scientists in Rajasthan who have had a break in their careers?

(A) Gargi Vigyan Yojana
(B) Indira Gandhi Matritva Poshan Yojana
(C) Mahila E-haat
(D) Women Scientist Scheme (WOS)

**74.** What is the primary objective of the 'Gargi Puraskar' in Rajasthan, which has a significant impact on STEM education for girls?

(A) To award top-performing schoolgirls cash prizes to encourage higher education
(B) To provide free laptops and digital tablets to all female post-graduate university students
(C) To fund international travel and research fellowships for early-career women researchers
(D) To provide comprehensive maternity and healthcare benefits to all working female scientists

NODIA

**75.** Which portal is designed to handle public grievances electronically and ensure their time-bound redressal in Rajasthan?

(A) RajKosh
(B) RajSampark
(C) RajFab
(D) e-Dharti

**76.** The 'RajKaj' software application implemented in Rajasthan is primarily meant for:

(A) Online booking and reservation of state tourism hotel and travel packages
(B) Electronic file tracking and workflow management for government staff
(C) Real-time GPS tracking and schedule monitoring of municipal public buses
(D) Managing tax collections and financial compliance for private businesses

**77.** Which e-Governance initiative aims to digitize all land records and maps in Rajasthan?

(A) Apna Khata (e-Dharti)
(B) e-Panjiyan
(C) RajAwas
(D) Bhumi-Raj

**58.** Under the Smart City Mission, which four cities of Rajasthan were selected for technological and infrastructural upgrade?
(A) Jaipur, Udaipur, Kota, Ajmer
(B) Jaipur, Jodhpur, Bikaner, Jaisalmer
(C) Udaipur, Jodhpur, Bhilwara, Alwar
(D) Jaipur, Udaipur, Jodhpur, Bikaner

**59.** What is the primary function of the 'Abhay Command and Control Centres' established in Rajasthan?
(A) To continuously monitor and track wildlife movement across national parks and sanctuaries
(B) To integrate surveillance, dial 112, and traffic management for policing
(C) To monitor and regulate the distribution and metering of electricity in urban areas
(D) To coordinate and manage state-level space launches and satellite tracking facilities

**60.** The 'e-Mitra Plus' machines installed across Rajasthan function primarily as:
(A) Automated Teller Machines (ATMs) operated exclusively for instant cash withdrawals
(B) Unmanned kiosks providing access to government services and document printing
(C) Fast-charging public electric vehicle charging stations installed across highways
(D) Automated vending machines designed for dispensing subsidized essential medicines

**61.** What does the term 'RajNet' refer to in the context of Rajasthan's IT infrastructure?
(A) A multi-mode network connecting Gram Panchayats to the state data centre
(B) A state-run social media platform built specifically for citizen interaction and news
(C) An integrated online portal designed for booking state roadway express bus tickets
(D) A dedicated communication satellite launched exclusively for the state of Rajasthan

**62.** Which of the following is NOT a feature of the Rajasthan Single Sign-On (SSO) system?
(A) One-time registration for access to multiple government applications
(B) Integration with Aadhaar and Jan Aadhaar for identity verification
(C) Requirement of separate logins for each department portal
(D) Highly secure and centralized authentication process for all citizens

**63.** The Rajasthan Agricultural Research Institute (RARI), a premier institute for crop innovation, is located at:
(A) Beechwal, Bikaner
(B) Mandor, Jodhpur
(C) Jobner, Jaipur
(D) Durgapura, Jaipur

**64.** Sri Karan Narendra Agriculture University (SKNAU), focusing on agricultural technology and extension, is located in:
(A) Bikaner
(B) Udaipur
(C) Jobner
(D) Kota

**65.** The Centre of Excellence for Date Palm, established to introduce modern agricultural technology in arid regions, is situated in which district?
(A) Jaisalmer
(B) Bikaner
(C) Barmer
(D) Jodhpur

**66.** To promote water efficiency in arid agriculture, the Rajasthan government provides heavy subsidies for the installation of which system?
(A) High-capacity hydro-electric pumps
(B) Deep borewells and tube well excavators
(C) Heavy canal dredging equipment
(D) Drip and sprinkler systems

**67.** Which of the following research centres focuses heavily on the improvement and technological application in camel breeding and health in Rajasthan?
(A) National Research Centre on Camel (NRCC)
(B) Central Sheep and Wool Research Institute (CSWRI)
(C) Central Arid Zone Research Institute (CAZRI)
(D) Arid Forest Research Institute (AFRI)

**68.** Consider the following statements about agricultural technology initiatives in Rajasthan:
I. Hydroponics is being tested as a soil-less farming technique to save water.
II. Custom Hiring Centres (CHCs) provide agricultural machinery on rent to small farmers.
III. Drones are legally banned from being used for pesticide spraying in Rajasthan.
IV. Precision farming techniques are promoted

Downloaded from www.pdf.tube

power plants
(C) Supplying high-yield disease-resistant genetically modified crop seeds
(D) Installing large-scale mechanized grain storage silos across Mandis

**88.** Choose the correct sequence of the establishment of the following scientific institutions in Rajasthan, from earliest to most recent:
(A) CAZRI → BITS Pilani → MNIT Jaipur
(B) BITS Pilani → CAZRI → MNIT Jaipur
(C) MNIT Jaipur → BITS Pilani → CAZRI
(D) CAZRI → MNIT Jaipur → BITS Pilani

**89.** Which unique energy policy was introduced by Rajasthan in 2019 to maximize the utilization of land and transmission infrastructure?
(A) Rajasthan Nuclear Power Generation Policy
(B) Rajasthan Geothermal Energy Policy
(C) Rajasthan Coastal Tidal Energy Policy
(D) Rajasthan Hybrid Energy Policy

**90.** What is the primary function of the 'Rajiv Gandhi National Drinking Water Mission' mapping project executed via satellite in Rajasthan?
(A) To locate potential groundwater aquifers for borewells
(B) To map air and water pollution levels across urban industrial zones
(C) To accurately measure water depth and siltation in large dams
(D) To track seasonal migration patterns of endangered water birds

**91.** The Abhedya Biological Park, which utilizes modern scientific techniques for wildlife conservation and zoo management, is located in:
(A) Jaipur
(B) Kota
(C) Jodhpur
(D) Udaipur

**92.** Consider the following statements regarding the Smart City Mission in Rajasthan:
I. Smart water meters and SCADA are components of the water management strategy.
II. Intelligent Traffic Management Systems (ITMS) are deployed for traffic regulation.
III. Heritage conservation uses 3D GIS mapping.
IV. Only non-renewable energy sources are permitted to power smart city control centres.
Which of the above statements are correct?
(A) I, II and III
(B) II, III and IV
(C) I, III and IV
(D) I, II and IV

**93.** What is the main objective of establishing 'Vigyan Bhavans' or Science Centres at regional levels in Rajasthan?
(A) To provide interactive exhibits for practical science learning
(B) To serve primarily as administrative headquarters for regional DST officials
(C) To function as state-level forensic science laboratories for crime investigation
(D) To preserve and store ancient historical manuscripts and archaeological finds

**94.** The Arid Forest Research Institute (AFRI), which develops technologies to increase vegetative cover in deserts, is located in:
(A) Bikaner
(B) Sriganganagar
(C) Jodhpur
(D) Churu

**95.** Which of the following portals is used by the Rajasthan government for online procurement and e-tendering to ensure transparency?
(A) e-Mitra Plus
(B) RajKaj
(C) Jan Soochna
(D) e-Procurement Portal (eproc.rajasthan.gov.in)

**96.** What is the role of the State Remote Sensing Application Centre (SRSAC) in disaster management in Rajasthan?
(A) It physically deploys emergency rescue and relief teams during severe flood events.
(B) It calculates and distributes direct financial compensation to drought-affected farmers.
(C) It provides satellite imagery for damage assessment and flood mapping.
(D) It manufactures and distributes emergency medical supplies to disaster-affected victims.

NODIA

**97.** The 'Rajiv Gandhi Innovation Award' in Rajasthan is aimed at encouraging:
(A) Traditional handicrafts artisans
(B) Start-ups and innovators
(C) Traditional folk dancers and musicians
(D) Prominent state sports personnel

**98.** Match the e-Governance portals of Rajasthan in List I with their primary purpose in List II:

**List I: e-Governance Portal**
P. SSO
Q. RajSampark
R. Shala Darpan
S. e-Mitra
**List II: Primary Purpose**
1. School Education Management
2. Single Sign-On Identity
3. Citizen Service Delivery Kiosk
4. Public Grievance Redressal
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-3, S-1
(C) P-2, Q-3, R-1, S-4
(D) P-1, Q-4, R-2, S-3

**99.** The technology of 'tissue culture' in Rajasthan is highly prioritized by the state government for the mass propagation of which commercial plant in desert districts?
(A) Date Palm
(B) Teak
(C) Sugarcane
(D) Rubber

**100.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Rajasthan promotes micro-irrigation systems like drip and sprinklers over conventional flood irrigation.
**Reason (R):** Rajasthan possesses only about 1% of the country's water resources despite having over 10% of its land area.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**101.** Which technology was widely utilized to track health parameters and coordinate resource distribution during the COVID-19 pandemic in Rajasthan?
(A) Raj-COVID Info App and GIS mapping
(B) Blockchain Technology
(C) Cryptocurrency
(D) Virtual Reality headsets

**102.** In the context of mineral technology, Hindustan Zinc Limited uses which environmentally sustainable technology to process zinc in Rajasthan?
(A) Conventional open-air roasting and burning of raw zinc ores
(B) Mercury amalgamation and chemical leaching techniques
(C) Direct dumping of toxic mine tailings into surrounding rivers
(D) Hydrometallurgical smelting processes

**103.** Which institute in Rajasthan is dedicated specifically to research and technology development in the field of veterinary and animal sciences?
(A) Rajasthan University of Health Sciences (RUHS)
(B) Rajasthan University of Veterinary and Animal Sciences (RAJUVAS), Bikaner
(C) SKNAU, Jobner
(D) MBM Engineering College, Jodhpur

**104.** The 'Student Project Programme' run by DST Rajasthan provides financial assistance to:
(A) High school students belonging to rural areas for buying STEM textbooks
(B) Doctoral PhD scholars pursuing specialized research studies abroad exclusively
(C) Final-year science and engineering students for executing research projects
(D) Small and marginal farmers for purchasing and installing solar agriculture pumps

**105.** Consider the following statements regarding space technology application in agriculture in Rajasthan:
I. Satellite data is used to monitor the progress of crop sowing.
II. Remote sensing helps in assessing crop damage due to drought or unseasonal rainfall.
III. Space imagery is used to physically harvest the crops.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**106.** The 'Raj WiFi' initiative of the Rajasthan Government aims to:
(A) Provide free Wi-Fi at Gram Panchayats and major public locations
(B) Install high-speed Wi-Fi routers in all private residential households for free

Click Here to Buy book on Flipkart

(C) Charge high premium subscription rates for high-speed internet in rural regions
(D) Block access to social media platforms and websites across sensitive border districts

**107.** Which major national scientific institution has a laboratory in Pilani (Rajasthan) specializing in advanced electronics and microwave engineering?
(A) National Physical Laboratory (NPL)
(B) Central Electronics Engineering Research Institute (CEERI)
(C) Indian Institute of Science (IISc)
(D) Bhabha Atomic Research Centre (BARC)

**108.** The 'Rural iStart' program aims to:
(A) Relocate established technology companies directly from urban cities to villages
(B) Foster innovation and support start-ups in rural Rajasthan
(C) Train local agricultural farmers in heavy industrial machinery manufacturing
(D) Replace all manual traditional farming operations completely with robotic automation

**109.** Which specialized agency was set up to promote biotechnology and its application across industries in the state?
(A) Rajasthan State Biotechnology Board / Council
(B) Rajasthan Atomic Energy Commission
(C) State Bureau of Genetics
(D) Desert Biotech Authority

**110.** Choose the correct sequence of the rollout of major e-governance platforms in Rajasthan from earliest to most recent:
(A) e-Mitra → SSO (Single Sign-On) → Jan Soochna Portal
(B) Jan Soochna Portal → SSO (Single Sign-On) → e-Mitra
(C) SSO (Single Sign-On) → e-Mitra → Jan Soochna Portal
(D) e-Mitra → Jan Soochna Portal → SSO (Single Sign-On)

**111.** Which toll-free helpline number is integrated with the Rajasthan Sampark portal for filing public grievances via phone?
(A) 100
(B) 104
(C) 181
(D) 108

**112.** The Bhamashah Techno Hub is primarily known as:
(A) A central state museum built for preserving rare ancient historical artefacts
(B) A high-capacity thermal power plant generating electricity for industrial hubs
(C) A major start-up incubator offering co-working space and mentoring
(D) A historical traditional rainwater harvesting reservoir constructed in Jaipur

**113.** Under the Rajasthan Start-up Policy, what is the role of the 'iStart Nest' incubators?
(A) To provide free residential housing facilities for government employees
(B) To provide incubation and mentoring to registered start-ups
(C) To train migratory birds for biological agricultural pest control in fields
(D) To construct and run primary government schools across remote rural areas

**114.** Which digital repository system was introduced by the Rajasthan Government to securely store and share personal documents of citizens?
(A) Raj Locker
(B) e-Pramaan
(C) Raj Box
(D) Raj e-Vault

**115.** Consider the following statements about the 'e-Mitra' service network:
I. It operates on a Public-Private Partnership (PPP) model.
II. It delivers G2C (Government to Citizen) and $B_2C$ (Business to Citizen) services.
III. It is available only in the district headquarters.
IV. It facilitates utility bill payments, birth certificates, and revenue document access.
Which of the above statements are correct?
(A) I, II and IV
(B) II, III and IV
(C) I, III and IV
(D) I, II and III

**116.** The state's initiative 'Raj e-Gyan' portal is designed to provide:
(A) Automated online processing and issuance of driving licenses
(B) Real-time agricultural commodity prices across major state Mandis
(C) Digital study material for school students and teachers

Downloaded from www.pdf.tube

IV. The state encourages the use of tissue culture to propagate high-yielding date palm varieties.

Which of the above statements is incorrect?
(A) I and III
(B) III only
(C) II and IV
(D) I, II and IV

**39.** Which technology is predominantly utilized at the Rawatbhata Nuclear Power Station in Rajasthan?
(A) Boiling Water Reactor (BWR)
(B) Pressurized Heavy Water Reactor
(C) Fast Breeder Reactor (FBR)
(D) Light Water Graphite Reactor (LWGR)

**40.** The Rawatbhata Nuclear Power Station is located in which district of Rajasthan?
(A) Kota
(B) Bundi
(C) Chittorgarh
(D) Jhalawar

**41.** The initial units of the Rajasthan Atomic Power Station (RAPS) were built with technical cooperation from which country?
(A) Soviet Union
(B) United States of America
(C) France
(D) Canada

**42.** A heavy water plant, vital for the operation of pressurized heavy water reactors, is located near Rawatbhata at:
(A) Kota
(B) Jaipur
(C) Udaipur
(D) Bhilwara

**43.** What is the proposed capacity of the upcoming Units 7 and 8 at the Rajasthan Atomic Power Project (RAPP)?
(A) 220 MW each
(B) 500 MW each
(C) 700 MW each
(D) 1000 MW each

**44.** Apart from Rawatbhata, where is the second nuclear power plant proposed to be set up in Rajasthan?
(A) Jaisalmer
(B) Banswara
(C) Dholpur
(D) Sirohi

**45.** Arrange the following e-governance platforms of Rajasthan in the logical order of their primary user interaction flow for a citizen filing a grievance:
I. Citizen registers on SSO (Single Sign-On)
II. Citizen receives resolution status via SMS
III. Concerned department processes the application on RajKaj
IV. Citizen lodges grievance on Rajasthan Sampark
(A) I, IV, III, II
(B) IV, I, II, III
(C) I, III, IV, II
(D) IV, III, I, II

**46.** Under space technology applications, the National Database for Emergency Management (NDEM) uses satellite data for which major purpose in Rajasthan?
(A) Designing and optimizing urban smart city road networks
(B) Tracking wild animal movements across expanding urban fringe areas
(C) Disaster management and early warning for floods
(D) Calculating and updating exact regional population census figures

**47.** Which ISRO portal is utilized by the Rajasthan state departments for geospatial governance and viewing satellite imagery of state resources?
(A) VEDAS
(B) MOSDAC
(C) Bhoomi
(D) Bhuvan

**48.** Match the institutions/projects in List I with their primary technological application in Rajasthan in List II:

**List I: Institution/Project**
P. RajDharaa
Q. CAZRI
R. iStart
S. SMILE

**List II: Technological Application**
1. Arid Zone Agricultural Research
2. Unified GIS Platform
3. Digital Education
4. Start-up Incubation

(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-1, S-3

NODIA

access exclusively to foreign tourists
(B) To launch and maintain an independent regional search engine for state citizens
(C) To establish a network connecting Gram Panchayats for e-governance delivery
(D) To build a secure closed intranet network strictly for police communications

**127.** Which DRDO facility in Rajasthan is primarily responsible for conducting weapons testing and evaluating defense technologies?
(A) DLJ Jodhpur
(B) Mahajan Field Firing Range
(C) CEERI Pilani
(D) Pokhran Field Firing Range

**128.** Match the state government apps/portals in List I with their primary target sector in List II:
**List I: App/Portal**
P. Raj Kisan Sathi
Q. Shala Darpan
R. RajKaj
S. iStart
**List II: Target Sector**
1. Government Employee Workflow
2. Agriculture & Farmers
3. Start-up & Entrepreneurship
4. School Administration
(A) P-2, Q-4, R-1, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-1, R-4, S-3
(D) P-4, Q-2, R-1, S-3

**129.** The Rajasthan government has integrated the 'e-Sanjeevani' portal primarily for which technological application?
(A) Online FIR registration and police complaint tracking
(B) Teleconsultation service for remote healthcare
(C) Electronic end-to-end tracking of PDS grain distribution
(D) Filing online annual income tax and property returns

**130.** Which specialized centre is established in Jaipur to impart cutting-edge training in technologies like Robotics, 3D printing, and IoT to the youth?
(A) Bhamashah Techno Hub
(B) FinTech Park
(C) Raj-Skill Lab
(D) Rajiv Gandhi Centre of Advanced Technology (R-CAT)

**131.** In the context of aerospace and defence, the 'Defence Manufacturing Corridor' benefits MSMEs located heavily in which region of Rajasthan due to its proximity to the NCR?
(A) Alwar-Bhiwadi
(B) Bikaner-Jaisalmer
(C) Udaipur-Dungarpur
(D) Kota-Jhalawar

**132.** Consider the following statements about the application of drones in Rajasthan's agriculture:
I. The government provides subsidies to farmer producer organizations (FPOs) for purchasing agri-drones.
II. Drones are used for precise spraying of nano-urea and pesticides.
III. Drone technology is prohibited in all desert districts due to high temperatures.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**133.** The 'Rajiv Gandhi FinTech Digital Institute' is being established in which city to promote technology-driven financial education?
(A) Jodhpur
(B) Jaipur
(C) Ajmer
(D) Udaipur

**134.** Which scientific technique is widely advocated by CAZRI for stabilizing shifting sand dunes in western Rajasthan?
(A) Covering moving sand dunes completely with thick concrete layers
(B) Levelling dunes completely using heavy earthmovers and bulldozers
(C) Pumping groundwater continuously to saturate and flood sand dunes
(D) Brushwood micro-windbreak fencing followed by afforestation

**135.** The 'Rajeev Gandhi Jal Sanchay Yojana' employs scientific watershed management using GIS mapping to achieve what goal?
(A) Constructing large-scale multi-purpose river valley dam projects
(B) Conserving rainwater and augmenting rural groundwater tables
(C) Supplying piped fresh water directly from Himalayas to Thar desert
(D) Diverting floodwaters exclusively toward

Click Here to Buy book on Amazon

**49.** (B) Groundwater
Space technology and Geographic Information System applications are extensively deployed in arid Rajasthan to locate potential subsurface groundwater aquifers. By analyzing lineaments, geomophological features, drainage patterns, and vegetation indexes on satellite imagery, hydrogeologists generate precise hydrogeomorphological maps that guide well-drilling and artificial recharge projects.

**50.** (D) Social Media Interface for Learning Engagement
SMILE stands for Social Media Interface for Learning Engagement, an innovative digital education initiative launched by Rajasthan's Education Department during the COVID-19 pandemic. It facilitated continuous home-based learning by curating daily educational content, curated video links, and digital worksheets distributed to students and teachers through organized WhatsApp groups.

**51.** (A) Mission Buniyaad
Mission Buniyaad is a digital learning initiative implemented in Rajasthan to bridge learning gaps and enhance educational outcomes. By utilizing adaptive learning software on digital tablets, the program provides personalized, self-paced learning content tailored to each student's learning level, particularly benefiting students in rural government schools across districts.

**52.** (C) Assertion (A) is true but Reason (R) is false.
Tele-medicine networks are vital for Rajasthan because the state is characterized by a sparse, unevenly distributed population spread across a vast desert geography with vast distances between settlements. Remote medical consultations bridge geographical barriers effectively, providing expert healthcare access to isolated rural areas without requiring long-distance physical travel.

**53.** (A) Vedanta (Cairn Oil & Gas)
The e-Kaksha project was developed through a strategic partnership between the Rajasthan Education Department and Vedanta's CSR initiative, Cairn Oil & Gas. The platform offers high-quality, syllabus-aligned digital video content for classes VI to XII, making standard educational resources accessible for free to government school students state-wide.

**54.** (D) It is a portal for government school administration and tracking student progress.
Shala Darpan is a comprehensive educational management portal run by the Rajasthan School Education Department. It serves as a centralized digital database for school administration, tracking student enrolment, academic performance, attendance records, teacher details, infrastructure availability, and scheme implementations across all government primary and secondary schools state-wide.

**55.** (A) I and II only
Digital education initiatives in Rajasthan incorporate the national DIKSHA portal for state-curated learning materials and operate the Vidya Samiksha Kendra for real-time educational monitoring. Physical textbooks have not been entirely replaced; instead, digital platforms, tablets, and interactive smart screens complement traditional textbooks to enrich learning experiences in schools.

**56.** (C) Rajasthan Vigyan Puraskar
The Rajasthan Vigyan Puraskar is the apex state-level award conferred by the Department of Science and Technology, Government of Rajasthan. It honors eminent scientists, researchers, and innovators for exceptional scientific contributions, technological developments, and significant breakthroughs that directly impact societal advancement and economic growth within the state.

**57.** (D) Department of Science & Technology, GoI
The INSPIRE scheme is a national flagship program conceptualized and fully funded by the Department of Science and Technology, Government of India. Implemented across Rajasthan schools, it aims to attract young talent toward science by awarding scholarship prizes and research grants to students demonstrating creative scientific innovation.

**58.** (A) Jaipur, Udaipur, Kota, Ajmer
Under the National Smart Cities Mission launched by the Government of India, four major cities of Rajasthan—Jaipur, Udaipur, Kota, and Ajmer—were selected for technological upgrades. These urban centres undergo comprehensive digital transformations, including intelligent traffic management, smart waste collection, SCADA-monitored water supply, and centralized command hubs.

NODIA

# ANSWERS

**1.** (B) To integrate science and technology into state development programs and foster innovation
The primary objective of the Rajasthan Science and Technology Policy is to integrate scientific research and technological applications into the state's socio-economic development programs. By fostering innovation, encouraging research and development, and building local technical infrastructure, the policy seeks to address regional challenges, improve administrative efficiency, and boost economic growth across key sectors.

**2.** (B) 1983
The Department of Science and Technology in Rajasthan was formally established in 1983 to promote scientific research and technological applications throughout the state. It acts as an apex body for planning, coordinating, and implementing scientific programs, creating awareness among citizens, promoting sustainable technological interventions, and supporting regional socio-economic development through research initiatives.

**3.** (A) Department of Science and Technology, Rajasthan
The State Remote Sensing Application Centre operates directly under the Department of Science and Technology, Government of Rajasthan. Located in Jodhpur, the centre plays a crucial role in utilizing space technology and satellite remote sensing data for planning, natural resource mapping, land-use management, environmental monitoring, and supporting various administrative departments.

**4.** (C) To create awareness and facilitate the filing of Intellectual Property Rights (IPR)
The Patent Information Centre was established by the Department of Science and Technology Rajasthan to create widespread awareness regarding Intellectual Property Rights among innovators, researchers, and entrepreneurs. It provides comprehensive technical guidance and logistical support for filing patents, trademarks, copyrights, and geographical indications, thereby safeguarding novel technological advancements across the state.

**5.** (A) Jhunjhunu
The Birla Institute of Technology and Science is a premier technical institution situated in Pilani, which falls under the Jhunjhunu district of Rajasthan. Established as a deemed university, it has earned international repute for excellence in higher engineering education, scientific research, technological innovation, and strong industry-academia collaboration since its inception.

**6.** (D) Malaviya Regional Engineering College
Malaviya National Institute of Technology in Jaipur was originally established in 1963 under the name Malaviya Regional Engineering College as a joint venture between the Central Government and State Government. It was subsequently upgraded to the status of a National Institute of Technology and granted deemed university status for engineering education.

**7.** (B) Jodhpur
The Central Arid Zone Research Institute is located in Jodhpur, Rajasthan. Established to address severe ecological and agricultural challenges in arid and semi-arid regions, the institute conducts advanced multidisciplinary research on soil conservation, drought mitigation, desertification control, sustainable crop production, and natural resource management across the Thar Desert ecosystem.

**8.** (A) I and II only
The Central Arid Zone Research Institute was established in 1959 at Jodhpur as a premier research institute operating under the Indian Council of Agricultural Research. Its primary mandate involves investigating arid zone ecology, sand dune stabilization, and desert agriculture, rather than coastal soil erosion, which is irrelevant to inland desert environments.

**9.** (D) Standardization of windbreak and shelterbelt plantation techniques
A major contribution of the Central Arid Zone Research Institute to desert agriculture is the standardization of windbreak and shelterbelt plantation techniques. These vegetative barriers effectively reduce soil erosion caused by fierce desert winds, retain essential soil moisture,

Downloaded from www.pdf.tube

heavy urban industrial zones

**136.** What is the fundamental purpose of the state-run 'Raj-Skill' portal?
(A) It is an interactive online gaming platform created for state youth entertainment.
(B) It provides a digital marketplace dedicated to selling local handloom products.
(C) It connects skilled workers with potential employers and industries.
(D) It registers and resolves public grievances related exclusively to unpaved roads.

**137.** Which state initiative focuses heavily on the digital empowerment of women by distributing free smartphones with internet connectivity?
(A) Gargi Digital Scheme
(B) Mahila e-Tech Yojana
(C) Raj-Laxmi Digital Plan
(D) Indira Gandhi Smartphone Yojana

**138.** Consider the following statements about e-governance in Rajasthan:
I. The 'Apna Khata' portal provides digital land records (Jamabandi).
II. 'e-Panjiyan' facilitates the online registration of properties.
III. 'Raj-Silicosis Portal' uses AI for rapid detection and certification of silicosis patients.
IV. 'Jan Aadhaar' acts as a single identifier for the entire family for subsidy transfers.
Which of the above statements are correct?
(A) I, II and IV
(B) II, III and IV
(C) I, III and IV
(D) I, II, III and IV

**139.** The state of Rajasthan has heavily adopted 'DBT' technology. What does DBT stand for in this e-governance context?
(A) Digital Business Transaction
(B) Direct Benefit Transfer
(C) Data Broadband Transmission
(D) Dual Band Technology

**140.** Arrange the following major milestones of Rajasthan's S&T and IT development in chronological order of their launch/establishment:
I. Establishment of the Department of Science & Technology (DST) Rajasthan
II. Launch of the iStart Rajasthan platform
III. Launch of the Jan Soochna Portal
IV. Commissioning of the first unit of Rajasthan Atomic Power Station (RAPS)
(A) IV, I, II, III
(B) I, IV, II, III
(C) IV, I, III, II
(D) I, II, IV, III

www.nodia.in

NODIA

impermeable plaster, it collects runoff from clean courtyard catchments, providing safe drinking water to rural households throughout severe dry seasons.

**20.** (C) Drip and sprinkler irrigation systems
In arid canal command areas like the Narmada Canal project in Rajasthan, the state government strictly mandates and promotes micro-irrigation systems such as drip and sprinkler irrigation. These advanced techniques optimize water distribution efficiency, minimize evaporation and seepage losses, prevent soil salinity buildup, and ensure higher agricultural crop yields.

**21.** (A) Tarun Bharat Sangh
Tarun Bharat Sangh is a non-governmental organization led by Magsaysay awardee Rajendra Singh, popularly known as the Waterman of India. The organization has successfully mobilized local communities across Rajasthan to construct and restore thousands of traditional water harvesting structures like Johads, effectively reviving dried rivers and boosting groundwater reserves.

**22.** (A) P-3, Q-1, R-4, S-2
Traditional water structures display distinct regional features across Rajasthan. Khadins are runoff agricultural systems unique to Jaisalmer, while Bawdis represent ornate stepwells famous in Bundi. Tankas are underground rainwater harvesting cisterns essential in desert homes, whereas Jhalras are rectangular community stepwells designed for public water needs, notably found in Jodhpur.

**23.** (B) Restoring local water bodies using scientific watershed planning
The Mukhya Mantri Jal Swavlamban Abhiyan aims to achieve sustainable water self-reliance in rural Rajasthan through integrated watershed planning. By combining traditional conservation wisdom with modern scientific technologies like GIS and remote sensing, the program restores degraded water bodies, constructs recharge structures, and enhances village groundwater reserves systematically.

**24.** (C) SCADA
Supervisory Control and Data Acquisition technology is deployed at major water installations like the Bisalpur Dam in Rajasthan. This automated digital system enables continuous real-time monitoring and remote control of water flow, reservoir capacity, pressure dynamics, and pipeline distribution networks, ensuring high operational precision and reducing distribution losses.

**25.** (D) RajDharaa
RajDharaa is the standardized, state-wide geospatial portal developed by the Rajasthan Government to support e-governance and spatial decision-making. By integrating high-resolution satellite imagery, administrative boundary maps, and departmental geographic layers, it serves as a centralized platform for land planning, infrastructure management, and resource monitoring across all administrative levels.

**26.** (A) Mapping and monitoring desertification and land degradation
Remote sensing technology is extensively utilized in Rajasthan for multi-temporal satellite monitoring of fragile ecosystems, mapping land degradation processes, and tracking desertification dynamics. By analyzing spectral signatures from spaceborne sensors, researchers and government authorities accurately assess soil erosion, vegetation cover changes, sand movement, and agricultural land degradation patterns.

**27.** (B) IRS (Indian Remote Sensing)
The National Remote Sensing Centre supplies multi-spectral satellite imagery to the State Remote Sensing Application Centre primarily from the Indian Remote Sensing satellite series. These Earth observation satellites provide high-resolution imagery crucial for spatial mapping, natural resource inventories, agricultural assessment, land-use planning, and environmental management across Rajasthan.

**28.** (A) I and II only
Geographic Information System technology plays an essential role in modern urban planning through 3D spatial modeling and enables precise route optimization and real-time tracking for emergency ambulance services. However, GIS tools complement rather than eliminate ground-level legal surveys required for official cadastral mapping and revenue administration in land records.

**29.** (A) FASAL
The FASAL project utilizes satellite remote sensing, GIS applications, and meteorological

Click Here to Buy book on Flipkart

minimize crop damage, and contribute significantly to stabilizing shifting sand dunes in dry environments.

**10.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Western Rajasthan offers ideal conditions for large-scale solar power generation due to its geographical characteristics. The region experiences exceptionally high solar insolation with over three hundred clear sunny days per year. Furthermore, the availability of vast, non-agricultural, barren land tracts provides suitable space for installing utility-scale solar photovoltaic plants efficiently.

**11.** (B) Jodhpur
The Bhadla Solar Park is located in the Jodhpur district of Rajasthan, spread across thousands of acres of arid land in Phalodi tehsil. Renowned as one of the world's largest solar power parks, it benefits from extremely high solar radiation levels, minimal cloud cover, and vast stretches of flat land.

**12.** (C) 2245 MW
Upon the full commissioning of all its operational phases, the Bhadla Solar Park achieved a total installed power generation capacity of approximately 2245 megawatts. Developed through multiple public-private partnerships, this massive solar energy installation plays a major role in expanding India's clean energy portfolio and driving regional industrial development.

**13.** (A) Rajasthan Renewable Energy Corporation Limited (RRECL)
Rajasthan Renewable Energy Corporation Limited serves as the nodal state agency responsible for promoting, developing, and executing non-conventional energy projects. Formed by merging the Rajasthan Energy Development Agency and the Rajasthan State Power Corporation Limited, it formulates clean energy policies and facilitates private investments in solar, wind, and biomass power.

**14.** (C) Amarsagar, Jaisalmer
Rajasthan's very first wind power project was officially commissioned in August 1999 at Amarsagar in the Jaisalmer district. Operated under state initiatives to harness renewable resources, this historical installation marked the commencement of commercial wind energy generation, leveraging the high velocity wind patterns prevailing in western desert areas.

**15.** (B) I, II and IV
The Rajasthan IT and Start-up Policy provides a robust ecosystem for entrepreneurs through the iStart platform, which offers single-window clearance, funding support, and the QRate assessment framework. However, the state's main flagship incubator, known as the Bhamashah Techno Hub, was established in Jaipur rather than Udaipur to nurture start-ups.

**16.** (C) To train youth in advanced information technology domains
The Rajiv Gandhi Centre of Advanced Technology in Jaipur was established to enhance employability among technical graduates by offering professional training in emerging IT domains. The centre delivers specialized courses in fields like artificial intelligence, machine learning, cloud computing, robotics, cybersecurity, and big data analytics in collaboration with leading technology companies.

**17.** (B) Jan Soochna Portal
The Jan Soochna Portal was launched by the Government of Rajasthan to promote transparency, proactive disclosure, and accountability in public administration. By providing seamless online access to detailed information regarding numerous government schemes and beneficiaries without requiring individual formal applications, it operationalizes Section 4(2) of the Right to Information Act.

**18.** (D) An earthen check dam constructed to capture surface runoff
A Johad is a traditional rainwater harvesting structure widespread in Rajasthan, consisting of a small earthen check dam constructed across a seasonal stream catchment. Designed to capture and impound surface runoff during monsoon rains, it allows water to percolate slowly into the ground, recharging dry aquifers and raising local groundwater levels.

**19.** (A) A covered underground cistern built to harvest rainwater
A traditional Tanka in western Rajasthan is a circular, covered underground cistern engineered to harvest and store pure rainwater. Constructed with stone masonry or concrete and lined with

NODIA

environmental pollution and promote sustainable waste management.

**39.** (B) Pressurized Heavy Water Reactor
The Rawatbhata Nuclear Power Station utilizes Pressurized Heavy Water Reactor technology across its operational units. This nuclear design uses natural uranium dioxide as fuel and heavy water as both a neutron moderator and coolant under high pressure, generating sustainable baseload electrical power safely for the regional power grid network.

**40.** (C) Chittorgarh
The Rawatbhata Nuclear Power Station, formally known as the Rajasthan Atomic Power Station, is situated in the Chittorgarh district of Rajasthan along the banks of the Rana Pratap Sagar reservoir on the Chambal River. The site was chosen due to abundant water availability required for industrial cooling operations.

**41.** (D) Canada
Initial construction of the Rajasthan Atomic Power Station at Rawatbhata was undertaken through technical cooperation between India and Canada. Based on the Canadian CANDU reactor design, the project introduced pressurized heavy water technology to India, establishing a foundational cornerstone for the nation's nuclear power energy program and indigenous engineering capability.

**42.** (A) Kota
A major heavy water plant operated by the Heavy Water Board is located at Kota, adjacent to the Rawatbhata nuclear facility complex. It manufactures high-purity deuterium oxide, which serves as an indispensable moderator and coolant required for the efficient operation of commercial Pressurized Heavy Water Reactors across India.

**43.** (C) 700 MW each
Units 7 and 8 under expansion at the Rajasthan Atomic Power Project in Rawatbhata feature indigenous Pressurized Heavy Water Reactor designs with a capacity of 700 megawatts each. These advanced reactors incorporate enhanced passive safety features, higher thermal efficiency, and modern automated safety mechanisms to boost clean power capacity significantly.

**44.** (B) Banswara
To meet growing long-term energy demands, Rajasthan's second nuclear power plant is proposed to be constructed at Mahi Banswara in the Banswara district. The planned installation will feature multiple indigenous 700 MW pressurized heavy water reactors, leveraging water resources from the Mahi River dam system for cooling purposes.

**45.** (A) I, IV, III, II
Filing a public grievance electronically in Rajasthan follows a structured sequential workflow. A citizen first registers on the Single Sign-On platform for digital access, then logs the specific grievance on the Rajasthan Sampark portal. The concerned government department processes the file internally via RajKaj, before sending automated status SMS updates.

**46.** (C) Disaster management and early warning for floods
The National Database for Emergency Management utilizes satellite remote sensing and spatial data to support disaster management operations in Rajasthan. By providing real-time data on hydrological patterns, flood inundation mapping, drought severity, and weather risks, it enables emergency decision-makers to implement timely warnings, evacuation plans, and relief operations.

**47.** (D) Bhuvan
Bhuvan is ISRO's flagship geoportal widely utilized by state departments in Rajasthan for spatial planning and administrative decision-making. The portal provides multi-resolution satellite imagery, thematic maps, and geographic layers, facilitating effective land monitoring, natural resource mapping, infrastructure tracking, and location-based governance throughout the state's departments.

NODIA

**48.** (A) P-2, Q-1, R-4, S-3
Institutions and digital programs in Rajasthan perform dedicated technological functions. RajDharaa serves as the integrated spatial GIS platform, while CAZRI focuses on arid agricultural research. The iStart initiative provides complete start-up incubation, whereas SMILE delivers digital educational content to school students across remote regions through social media tools.

**69.** (A) Defence Research and Development Organisation
The Defence Laboratory Jodhpur is a key research establishment operating under the Defence Research and Development Organisation of the Ministry of Defence. Established in 1959, the laboratory focuses on specialized defense research, focusing on desert environmental technologies, camouflage systems, radar absorbing materials, and nuclear radiation monitoring instruments.

**70.** (D) Desert warfare technologies, camouflage, and water purification
Defence Laboratory Jodhpur specializes in operational technologies suited for desert environments. Key research domains include camouflage techniques, radar cross-section reduction, desert environmental studies, mobile desalination plants, solar water purification systems, and radiation safety equipment, directly supporting the tactical operational capability of Indian armed forces in arid border zones.

**71.** (B) Attract investment and build MSME clusters for defence manufacturing
The Aerospace and Defence Manufacturing Policy of Rajasthan is designed to establish a conducive ecosystem for attracting private investment, technology transfer, and infrastructure creation. It focuses on establishing industrial manufacturing clusters, encouraging local MSMEs to supply components, and developing specialized skills for the defense and aerospace sectors state-wide.

**72.** (A) P-2, Q-1, R-4, S-3
Scientific institutions in Rajasthan address distinct research fields. CEERI Pilani specializes in electronics and semiconductor engineering, whereas AFRI Jodhpur conducts arid forestry and ecological studies. NRCC Bikaner dedicates research to camel breeding and health, while RARI Durgapura focuses on agricultural technology, crop breeding, and plant genetic development.

**73.** (D) Women Scientist Scheme (WOS)
The Women Scientist Scheme is actively promoted by the Department of Science and Technology to support qualified female scientists and technologists who faced a career break. The scheme provides research fellowships and grants, enabling women researchers to return to mainstream scientific development, conduct independent research, and pursue doctoral degrees.

**74.** (A) To award top-performing schoolgirls cash prizes to encourage higher education
The Gargi Puraskar is an educational incentive scheme in Rajasthan designed to encourage academic excellence among female school students. By awarding cash incentives and merit certificates to top-performing girls in secondary board examinations, the scheme reduces dropout rates and motivates young women to pursue higher studies in STEM subjects.

**75.** (B) RajSampark
RajSampark is Rajasthan's flagship online public grievance redressal portal. It provides citizens with a multi-channel platform—including web portals, mobile apps, and toll-free contact centres—to register grievances against government services. The system features automated file routing, real-time status tracking, and strict time-bound resolution mechanisms across administrative departments.

**76.** (B) Electronic file tracking and workflow management for government staff
RajKaj is an enterprise-wide e-office application implemented for government employees across Rajasthan. The system digitizes internal administrative workflows by facilitating electronic file creation, digital signature approvals, leave management, service record tracking, and performance appraisals, significantly enhancing transparency, speed, and paperless administrative processing in state secretariats.

**77.** (A) Apna Khata (e-Dharti)
Apna Khata, also known as e-Dharti, is Rajasthan's web portal dedicated to digitizing land records. Maintained by the Revenue Department, it allows landowners to access, view, and download certified copies of Jamabandi records, land ownership details, and spatial maps online, thereby streamlining land administration and reducing property disputes.

**78.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The Jan Soochna Portal substantially reduces the need for citizens to file formal Right to Information requests by proactively publishing transparent, real-time data regarding beneficiary

Downloaded from www.pdf.tube

**59.** (B) To integrate surveillance, dial 112, and traffic management for policing
Abhay Command and Control Centres are state-of-the-art technological hubs established across district headquarters in Rajasthan to modernize law enforcement. Integrating high-definition CCTV video surveillance, automated number plate recognition, GIS mapping, intelligent traffic control, and emergency response services like Dial 112, these centres significantly improve urban public safety.

**60.** (B) Unmanned kiosks providing access to government services and document printing
e-Mitra Plus kiosks are self-service, unmanned digital terminals installed at public locations across Rajasthan. Equipped with interactive touchscreens, cash and card payment acceptors, biometrics, and integrated printing facilities, these kiosks allow citizens to apply for government services, pay utility bills, and print official certificates independently without human intervention.

**61.** (A) A multi-mode network connecting Gram Panchayats to the state data centre
RajNet represents a state-wide unified communication network infrastructure established in Rajasthan. Utilizing satellite terminals, optical fiber cables, and wireless connectivity, it seamlessly connects government offices from the State Data Centre down to Gram Panchayats, facilitating high-speed data transfer, voice communication, video conferencing, and reliable online service delivery.

**62.** (C) Requirement of separate logins for each department portal
The Rajasthan Single Sign-On system eliminates the operational hassle of maintaining multiple digital credentials across various state portals. By providing every citizen with a unified digital identity linked to Aadhaar or Jan Aadhaar, SSO grants seamless single-login access to hundreds of e-governance services, applications, and public management systems securely.

**63.** (D) Durgapura, Jaipur
The Rajasthan Agricultural Research Institute is a premier research station located at Durgapura in Jaipur. Functioning under the State Agricultural University system, the institute conducts pioneering scientific research in crop breeding, disease resistance, soil fertility, seed production, and dryland farming technologies specifically tailored to regional agro-climatic conditions.

**64.** (C) Jobner
Sri Karan Narendra Agriculture University is a specialized agricultural institution located in Jobner, near Jaipur. Established to foster higher education and technology transfer in agricultural sciences, the university conducts advanced research in dryland farming, organic agriculture, seed technology, and extension services to assist farming communities in Rajasthan.

**65.** (B) Bikaner
The Centre of Excellence for Date Palm is situated in Bikaner, Rajasthan. Established under the Indo-Israel Agriculture Project, the centre focuses on advancing tissue-culture date palm cultivation, efficient micro-irrigation management, and post-harvest technology, successfully commercializing date farming in the hyper-arid zones of the Thar Desert.

**66.** (D) Drip and sprinkler systems
To conserve scarce water resources, the Rajasthan Government offers substantial financial subsidies to farmers adopting micro-irrigation systems, specifically drip and sprinkler technology. These efficient systems direct water and nutrients precisely to plant root zones, minimizing evaporative losses, controlling weed growth, and optimizing agricultural output in dry soils.

**67.** (A) National Research Centre on Camel (NRCC)
The National Research Centre on Camel, located in Bikaner, is a dedicated national institute under ICAR focused on camel health, breeding, and production management. The centre undertakes genetic improvement, scientific health maintenance, and product development, such as camel milk processing, to support pastoral livelihoods in desert regions.

**68.** (A) I, II and IV
Agricultural technological advancements in Rajasthan promote hydroponic farming for water efficiency, establish Custom Hiring Centres to rent modern machinery to small farmers, and utilize precision farming for balanced nutrient delivery. Agricultural drones are actively encouraged, regulated, and subsidized for safe pesticide spraying, rather than being legally prohibited.

NODIA

modeling to perform pre-harvest crop acreage estimation and yield forecasting. In Rajasthan, this technological framework facilitates crop monitoring, provides objective empirical data for agricultural planning, and aids in accurate settlement of crop insurance claims under national agricultural schemes.

**30.** (C) Vigyan Rail
Vigyan Rail is a specialized mobile science exhibition on wheels, organized collaboratively by national scientific agencies to disseminate scientific knowledge. Travelling across various railway stations in Rajasthan, it showcases interactive scientific models, technological innovations, and educational exhibits, successfully fostering a strong scientific temper among students residing in remote regions.

**31.** (D) Pilani
The Birla Science Museum is situated in Pilani, located within the Jhunjhunu district of Rajasthan. Established within the educational campus, this renowned technological museum houses diverse interactive exhibits, historical scientific models, astronomical instruments, and technological displays, playing an important role in promoting scientific education and curiosity among visitors.

**32.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The establishment of regional science centres and science parks across various districts by the state government stems directly from the constitutional mandate to develop a scientific temper, humanism, and spirit of inquiry. These interactive educational facilities demystify natural phenomena through hands-on exhibits, effectively countering widespread social superstitions and promoting rational thought.

**33.** (A) 28th February
National Science Day is celebrated annually on the 28th of February across Rajasthan to commemorate Sir C.V. Raman's landmark discovery of the Raman Effect in 1928. The Department of Science and Technology marks this occasion by organizing lectures, science exhibitions, competitions, and public awareness activities to highlight scientific progress.

**34.** (D) Vigyan Mitra Clubs
To cultivate scientific curiosity and experimental skills among school students, the Department of Science and Technology Rajasthan supports the setup of Vigyan Mitra Clubs. These extracurricular science clubs organize hands-on experiments, scientific quizzes, model-making competitions, and nature study camps, encouraging active student participation in scientific concepts outside textbooks.

**35.** (B) Bhadla Solar Park → Nokh Solar Park → Phalodi Solar Park → Rawatbhata Solar Park
Solar power installations in Rajasthan vary significantly in operational and planned capacities. The Bhadla Solar Park leads with over 2200 MW, followed by major utility-scale installations like the Nokh Solar Park and Phalodi Solar Park. Thermal and nuclear locations like Rawatbhata host smaller auxiliary solar capacity relative to utility parks.

**36.** (C) To completely ban the use of bio-fertilizers in the state
The Rajasthan Biotechnology Policy 2015 aims to encourage sustainable development through advanced biological research. It promotes bio-informatics, tissue culture techniques, medicinal plant preservation, and eco-friendly agricultural inputs. Far from banning bio-fertilizers, the policy actively promotes their widespread adoption to reduce dependency on synthetic chemical fertilizers and improve soil health.

**37.** (A) To upgrade ore quality by removing gangue before smelting
Ore beneficiation is a physical and chemical mineral processing technology applied to low-grade ores in Rajasthan. By selectively separating valuable metallic minerals from unwanted gangue material through crushing, grinding, flotation, or magnetic separation, this process significantly increases the metal concentration, rendering smelting operations economically viable and energy-efficient.

**38.** (B) III only
Marble slurry generated from stone cutting industries in Rajasthan is not legally banned from utilization. Instead, regulatory bodies and research institutions actively mandate and incentivize its recycling into industrial products such as eco-friendly bricks, synthetic marble, tiles, and concrete paving blocks to mitigate

Click Here to Buy book on Amazon

lists, scheme expenditures, and service delivery status online. Centralizing information on one platform ensures open governance and upholds transparent administrative practices across departments.

**79.** (D) Jaipur
The FinTech Park is developed in Jaipur by the Rajasthan State Industrial Development and Investment Corporation. The specialized park aims to establish a world-class IT and financial infrastructure hub, attracting global technology firms, banking institutions, and financial technology start-ups while creating high-skill employment opportunities for state youth.

**80.** (C) State Level Science Fairs
To foster an innovative ecosystem among young minds, DST Rajasthan annually organizes State Level Science Fairs in collaboration with educational authorities. These competitive events offer students platforms to demonstrate original working models, innovative scientific projects, and technological solutions, encouraging analytical thinking, creativity, and practical problem-solving skills across schools.

**81.** (B) Avikanagar (Malpura)
The Central Sheep and Wool Research Institute is located at Avikanagar in Malpura, Tonk district of Rajasthan. Operating under ICAR, this premier institute conducts comprehensive technological research in sheep genetics, wool processing, nutritional improvement, disease control, and meat technology, significantly benefiting rural livestock farming communities in arid and semi-arid zones.

**82.** (A) I and II only
The State Innovation Council in Rajasthan focuses on promoting an innovation ecosystem by nurturing grassroots innovators, encouraging creative thinking in educational institutions, and linking academic research to industry. However, regulatory oversight for Foreign Direct Investment falls strictly under the jurisdiction of the Central Government, not the State Innovation Council.

**83.** (A) Water supply projects like Bisalpur Dam
In Rajasthan, Supervisory Control and Data Acquisition systems are most prominently integrated into large-scale urban and rural drinking water projects, such as the Bisalpur Dam distribution system. SCADA enables centralized, real-time operational control, pressure monitoring, flow automation, leak detection, and efficient management across vast bulk water delivery pipelines.

**84.** (C) Department of Science and Technology (DST)
The Department of Science and Technology, Government of Rajasthan, is the primary agency responsible for setting up Science Parks across various district headquarters. These parks house interactive exhibits, open-air scientific models, digital planetariums, and activity centres designed to simplify complex scientific laws and cultivate scientific curiosity among the general public.

NODIA

**85.** (A) II, III, IV, I
The incubation process within the iStart Rajasthan framework follows a structured progression. A start-up first completes online portal registration, followed by an objective QRate assessment and rating evaluation. Subsequently, founders pitch their business plan before the state-level committee, after which approved funding or sustenance allowances are officially disbursed.

**86.** (D) Remote Sensing and GIS
Remote Sensing and Geographic Information Systems are the core technological tools used in Rajasthan for forest resource monitoring. High-resolution multispectral satellite data enables forest authorities to track temporal forest canopy density changes, map afforestation programs, monitor illegal deforestation, control forest fires, and plan conservation efforts across protected natural reserves.

**87.** (B) Setting up solar agriculture pumps and power plants
The Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan scheme heavily implemented in Rajasthan provides off-grid and grid-connected solar agricultural water pumps to farmers. By replacing diesel-powered irrigation equipment with clean solar power, the initiative reduces farming operational costs, guarantees reliable daytime power supply, and encourages sustainable groundwater usage.

offices down to the Gram Panchayat level. Utilizing optical fiber, satellite links, and wireless technology, RajNet ensures continuous high-speed data connectivity for delivering e-governance services, video conferencing, and online citizen facilities.

**127.** (D) Pokhran Field Firing Range
The Pokhran Field Firing Range in the Jaisalmer district of Rajasthan is the key testing facility utilized by DRDO and the Indian Armed Forces. The vast desert range provides safe operational space for conducting field evaluation trials of missile systems, heavy artillery, armored vehicles, ammunition, and defense equipment.

**128.** (A) P-2, Q-4, R-1, S-3
Digital platforms in Rajasthan serve designated governance sectors. Raj Kisan Sathi provides integrated digital services to farmers, while Shala Darpan manages school administrative records. RajKaj streamlines electronic file processing for state employees, whereas iStart serves as the primary ecosystem for nurturing start-ups, technical innovation, and private entrepreneurship across the state.

**129.** (B) Teleconsultation service for remote healthcare
The e-Sanjeevani portal has been integrated into Rajasthan's healthcare delivery system to provide accessible telemedicine and doctor-to-doctor consultations. The digital platform allows patients in remote rural areas to consult specialist doctors online, receive electronic prescriptions, and access expert medical guidance without requiring physical visits to distant urban tertiary hospitals.

**130.** (D) Rajiv Gandhi Centre of Advanced Technology (R-CAT)
The Rajiv Gandhi Centre of Advanced Technology in Jaipur is established as a high-tech training institute to upskill engineering graduates. Partnering with global technology corporations, R-CAT offers specialized certification courses in emerging technological domains, including robotics, 3D printing, internet of things, artificial intelligence, big data, and cloud computing.

**131.** (A) Alwar-Bhiwadi
The Alwar-Bhiwadi industrial belt benefits significantly from the Aerospace and Defence Manufacturing Policy due to its strategic geographic proximity to the National Capital Region. The region possesses an established industrial cluster with numerous engineering MSMEs, robust logistical transport networks, and skilled workforce availability suitable for manufacturing defense components.

**132.** (A) I and II only
The Rajasthan Government actively promotes agricultural drone technology by offering financial subsidies to Farmer Producer Organizations and custom hiring operators. Drones enable precise spraying of liquid nano-urea and crop protection chemicals, saving input costs and reducing health risks. Drone usage is successfully deployed in desert districts without thermal bans.

**133.** (A) Jodhpur
The Rajiv Gandhi FinTech Digital Institute is established in Jodhpur to foster specialized education, research, and skill development in financial technology. The institute offers advanced academic programs and industry-aligned training in financial computing, digital banking systems, blockchain applications, cybersecurity, and data analytics to support India's growing fintech sector.

**134.** (D) Brushwood micro-windbreak fencing followed by afforestation
To stabilize shifting sand dunes in western Rajasthan, CAZRI developed a proven technique involving the erection of brushwood micro-windbreak barriers arranged in checkerboard patterns across dunes. These barriers reduce wind velocity at ground level, trapping blowing sand, after which drought-hardy grasses, shrubs, and desert trees are planted for long-term vegetative stabilization.

**135.** (B) Conserving rainwater and augmenting rural groundwater tables
The Rajeev Gandhi Jal Sanchay Yojana utilizes modern GIS mapping and satellite remote sensing to execute scientific watershed management projects in rural Rajasthan. The scheme focuses on harvesting rainwater, rejuvenating traditional water bodies, constructing earthen check dams, and restoring catchment areas to systematically augment depleted rural groundwater tables.

**136.** (C) It connects skilled workers with potential employers and industries.
The Raj-Skill portal is an online employment matching platform created by the Rajasthan

Downloaded from www.pdf.tube

addressing key socio-economic and industrial challenges in the state.

**98.** (A) P-2, Q-4, R-1, S-3
e-Governance portals in Rajasthan fulfil distinct public administrative duties. Single Sign-On provides unified digital identity authentication, while RajSampark functions as the primary public grievance portal. Shala Darpan manages school administration and student monitoring, whereas e-Mitra operates as the nationwide citizen service delivery network through local service kiosks.

**99.** (A) Date Palm
Plant tissue culture technology is heavily prioritized in Rajasthan for the mass micropropagation of high-yielding date palm varieties. This bio-technological technique produces disease-free, genetically uniform plantlets in large quantities, enabling successful large-scale commercial date palm cultivation in the extreme arid and desert conditions of western districts.

**100.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
Rajasthan promotes micro-irrigation systems like drip and sprinklers because the state accounts for over 10% of India's geographic landmass but possesses only about 1% of its surface water resources. Micro-irrigation drastically minimizes water wastage, controls evaporation, and optimizes crop output per unit of precious water applied.

**101.** (A) Raj-COVID Info App and GIS mapping
During the COVID-19 pandemic, the Rajasthan Government deployed digital tools such as the Raj-COVID Info App combined with GIS spatial mapping. These tools enabled real-time tracking of isolated patients, monitoring quarantine compliance, mapping infection hotspots, coordinating emergency hospital bed availability, and distributing critical medical supplies efficiently state-wide.

**102.** (D) Hydrometallurgical smelting processes
Hindustan Zinc Limited utilizes modern hydrometallurgical processing technology at its smelting plants in Rajasthan. Unlike older pyrometallurgical methods, this energy-efficient and environmentally sustainable hydrometallurgical process extracts pure zinc through chemical leaching and electrolysis, significantly reducing atmospheric sulfur emissions and optimizing resource recovery from complex mineral ores.

**103.** (B) Rajasthan University of Veterinary and Animal Sciences (RAJUVAS), Bikaner
The Rajasthan University of Veterinary and Animal Sciences, located in Bikaner, is a specialized institution dedicated to veterinary education, clinical research, and livestock healthcare development. The university develops modern breeding technologies, animal disease diagnostics, vaccine production, and clinical treatments to improve livestock productivity and rural economy across Rajasthan.

**104.** (C) Final-year science and engineering students for executing research projects
The Student Project Programme operated by DST Rajasthan provides financial grants and technical support to final-year science, engineering, and technology students. The initiative aims to encourage practical scientific research by enabling students to execute innovative, socially relevant technological projects under the mentorship of faculty guides in institutional laboratories.

NODIA

**105.** (A) I and II only
Space technology applications in agriculture involve utilizing satellite remote sensing data to monitor regional crop sowing progress, evaluate crop health, and estimate crop damage caused by floods or droughts. However, space imagery is used exclusively for spatial data analysis and monitoring, not for physical harvesting operations on farms.

**106.** (A) Provide free Wi-Fi at Gram Panchayats and major public locations
The Raj WiFi initiative launched by the Government of Rajasthan aims to expand internet accessibility across rural and urban regions. By setting up free public Wi-Fi hotspots at Gram Panchayat headquarters, bus terminals, public parks, and government institutes, the program promotes digital inclusion, enabling citizens to access e-governance services easily.

# CHAPTER 16
# Physical and Chemical Changes

**1.** Which of the following statements provides the most scientifically accurate definition of a physical change?
(A) A change where a substance undergoes a transformation in its chemical composition but retains its physical state.
(B) A change in which the physical properties of a substance alter without any change in its molecular composition or identity.
(C) A transformation accompanied by a substantial release of energy and the formation of irreversible byproducts.
(D) A process in which intermolecular and intramolecular bonds are both permanently broken.

**2.** When observing the melting of a solid element, which fundamental level of structure remains completely unaltered during this physical change?
(A) The spatial arrangement of the molecules or atoms
(B) The kinetic energy of the constituent particles
(C) The intermolecular distances between the molecules
(D) The intramolecular chemical bonds within the molecules

**3.** Which of the following is NOT typically a characteristic of a physical change?
(A) A new chemical substance with entirely different chemical properties is formed.
(B) The transformation is generally reversible by altering physical conditions like temperature or pressure.
(C) The overall mass of the substance remains constant before and after the change.
(D) The change primarily affects physical properties such as state, colour, or density.

**4.** During the physical change of a given substance from a liquid to a gaseous state, what happens to the specific heat capacity of the substance?
(A) It remains absolutely identical across both physical states.
(B) It becomes completely negligible in the gaseous state.
(C) It changes because specific heat capacity is dependent on the physical state of the substance.
(D) It increases infinitely once the boiling point is reached.

**5.** In the context of thermodynamics, why is the enthalpy change associated with a physical change generally much smaller than that of a chemical change?
(A) Physical changes involve breaking weak intermolecular forces, whereas chemical changes disrupt stronger intramolecular chemical bonds.
(B) Physical changes operate entirely without requiring any absorption or evolution of energy under standard conditions.
(C) Chemical changes take place exclusively at elevated temperatures, which dramatically elevates their overall enthalpy.
(D) Physical changes occur almost instantaneously, which completely prevents significant energy transfer from occurring.

**6.** Which of the following accurately describes a defining characteristic of a chemical change?
(A) The physical state of the reactant substance changes while its molecular formula remains completely intact.
(B) The change can easily be reversed using simple laboratory physical separation methods like filtration.
(C) There is absolutely no net absorption or evolution of thermal energy throughout the entire process.
(D) Reactants lose their original chemical identity to form one or more entirely new substances.

**7.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The digestion of food in the human body is considered a chemical change.

Click Here to Buy book on Flipkart

curriculum for primary and secondary education levels.

**117.** (A) Manufacturing tiles, synthetic marble, and road construction materials
To tackle environmental land pollution caused by massive marble slurry waste in stone cutting hubs like Kishangarh, technological solutions convert this slurry into useful products. Slurry powder is recycled into high-quality paving tiles, synthetic marble blocks, cellular concrete, and road construction materials, converting industrial waste into valuable infrastructure resources.

**118.** (D) Barmer-Bikaner belt
Lignite gasification technology holds significant strategic importance for the Barmer-Bikaner belt in western Rajasthan due to its substantial underground lignite deposits. Converting solid low-grade lignite into synthetic gas through underground or surface gasification enables cleaner power generation, syngas production, and fertilizer manufacturing while minimizing surface environmental disruption.

**119.** (B) Capturing surface runoff to retain soil moisture for rabi crops
The traditional Khadin system developed in Jaisalmer is an ingenious runoff agricultural mechanism designed for hyper-arid areas. Surface runoff from rocky catchments is collected behind a long earthen bund constructed across farmland, allowing water to saturate the soil deeply. After the water recedes, crops are cultivated on retained soil moisture.

**120.** (C) PCTS (Pregnancy and Child Tracking System)
The Pregnancy and Child Tracking System is an online healthcare software application utilized by Rajasthan's Health Department. It tracks and monitors individual health records of pregnant women, mothers, and newborns, ensuring timely delivery of prenatal care, institutional deliveries, post-natal care, and immunization coverage across urban and rural healthcare centres.

**121.** (D) Ajmer (Tabiji)
The National Research Centre on Seed Spices is located at Tabiji in the Ajmer district of Rajasthan. Operating under ICAR, the institute conducts scientific research on genetic enhancement, high-yielding disease-resistant crop varieties, precision farming techniques, post-harvest management, and processing technologies for major seed spices like cumin, coriander, and fenugreek.

**122.** (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
The Rajasthan Start-up Policy contains targeted financial incentives, higher sustenance allowances, and incubation support specifically reserved for women entrepreneurs. This policy design stems directly from the state's strategic objective to promote gender inclusivity, reduce economic gender disparity, and empower female innovators in technical fields and business enterprises.

**123.** (B) Identify local problems and build technology-driven solutions
The iStart School & Rural Innovation Challenge is designed to encourage students across schools and rural areas to apply creative thinking to local community issues. Participants are guided to identify real-world challenges, conceptualize innovative business models, and leverage modern digital technologies to build practical, scalable, and impactful solutions.

**124.** (B) Science Park, Pushkar
The Department of Science and Technology in Rajasthan has established regional Science Parks across several district headquarters, including Jaipur, Jhalawar, Nawalgarh, and Kota, to popularize scientific knowledge through interactive models. However, there is no official state-recognized Science Park constructed or operating in Pushkar.

**125.** (A) Renting advanced agricultural machinery and drones to farmers
Custom Hiring Centres utilize digital platforms to provide agricultural machinery rental services to small and marginal farmers across Rajasthan. These centres allow farmers to hire expensive agricultural equipment, modern tractors, seed drills, harvesters, and specialized spraying drones on an affordable pay-per-use basis, making mechanized farming accessible and cost-effective.

**126.** (C) To establish a network connecting Gram Panchayats for e-governance delivery
The primary objective of the RajNet project is to build a robust, state-wide digital network infrastructure connecting administrative

Downloaded from www.pdf.tube

**88.** (A) CAZRI → BITS Pilani → MNIT Jaipur
The historical timeline of scientific institutions in Rajasthan shows CAZRI established in 1959 at Jodhpur, followed by the formal founding of BITS Pilani as a deemed university in 1964. Malaviya Regional Engineering College, which later became MNIT Jaipur, was established in 1963 and subsequently upgraded to full national status.

**89.** (D) Rajasthan Hybrid Energy Policy
Rajasthan introduced the Solar, Wind, and Hybrid Energy Policy in 2019 to optimize land usage and grid transmission infrastructure. By encouraging the co-location of wind turbines and solar photovoltaic panels at the same site, the policy ensures continuous clean energy generation, stabilizes power output, and maximizes power evacuation capacity efficiently.

**90.** (A) To locate potential groundwater aquifers for borewells
Under the Rajiv Gandhi National Drinking Water Mission satellite project, space remote sensing and spatial GIS mapping are deployed across Rajasthan to identify potential subsurface groundwater aquifers. Hydrogeomorphological mapping aids state departments in pinpointing suitable locations for drilling rural drinking water wells and constructing artificial groundwater recharge structures.

**91.** (B) Kota
The Abhedya Biological Park is located in the Kota district of Rajasthan. Designed with modern zoo engineering standards and scientific wildlife management practices, the biological park provides naturalistic enclosures, veterinary healthcare infrastructure, and captive breeding facilities for native and exotic fauna, supporting biodiversity conservation and public scientific awareness.

**92.** (A) I, II and III
Smart City projects in Rajasthan integrate advanced technological solutions, including SCADA-monitored smart water metering, Intelligent Traffic Management Systems for traffic signal automation, and 3D GIS spatial mapping for heritage building preservation. Smart city control centres prioritize energy efficiency and utilize renewable solar energy sources rather than exclusively non-renewable power.

**93.** (A) To provide interactive exhibits for practical science learning
Regional Vigyan Bhavans and Science Centres are established to demystify complex scientific principles through interactive, hands-on learning exhibits. Serving as non-formal educational venues, these centres offer students and the public open access to scientific models, astronomy shows, and practical demonstrations, encouraging inquiry-based learning and scientific thinking across districts.

**94.** (C) Jodhpur
The Arid Forest Research Institute is located in Jodhpur, Rajasthan. Functioning under the Indian Council of Forestry Research and Education, the institute conducts scientific research in forestry technology, eco-restoration of hyper-arid areas, desert tree breeding, agroforestry models, and soil conservation to increase vegetative cover across arid regions.

NODIA

**95.** (D) e-Procurement Portal (eproc.rajasthan.gov.in)
The e-Procurement Portal is the official digital tender platform operated by the Government of Rajasthan. It mandates electronic bidding, tender submission, document evaluation, and vendor registration for all public procurement processes across departments, thereby enforcing transparency, preventing cartels, reducing administrative delays, and ensuring fair commercial competition.

**96.** (C) It provides satellite imagery for damage assessment and flood mapping.
During natural disasters, the State Remote Sensing Application Centre plays a vital technical role by providing high-resolution satellite imagery and spatial data. This real-time geospatial information enables state emergency agencies to perform precise flood extent mapping, assess infrastructural damage, monitor drought severity, and coordinate emergency relief operations efficiently.

**97.** (B) Start-ups and innovators
The Rajiv Gandhi Innovation Award was instituted by the Rajasthan Government to foster entrepreneurship and technological advancements. The award offers financial grants and recognition to promising start-ups, young innovators, and technology ventures that develop impactful, commercially viable solutions

Government to bridge the gap between job seekers and employers. It registers skilled workers, ITI graduates, and technicians, matching their technical skills with recruitment demands from private industries, micro enterprises, and commercial establishments state-wide.

**137.** (D) Indira Gandhi Smartphone Yojana
The Indira Gandhi Smartphone Yojana is a landmark digital inclusion scheme launched by the Rajasthan Government to empower women. Under the initiative, eligible female heads of Jan Aadhaar families receive free smartphones pre-loaded with internet data connections, facilitating access to digital education, government portals, and online banking facilities.

**138.** (D) I, II, III and IV
Rajasthan's e-governance infrastructure encompasses diverse portals: Apna Khata provides digital land records, e-Panjiyan streamlines online property registration, and the Raj-Silicosis Portal utilizes automated systems for rapid silicosis certification. Additionally, Jan Aadhaar serves as a single family digital identifier for seamless transfer of state welfare cash subsidies directly.

**139.** (B) Direct Benefit Transfer
In the context of e-governance and social welfare delivery in Rajasthan, DBT stands for Direct Benefit Transfer. This technology mechanism links state welfare schemes to Jan Aadhaar and bank accounts, enabling direct, transparent, and instant electronic transfer of cash subsidies, pensions, and financial assistance into beneficiary accounts without intermediaries.

**140.** (A) IV, I, II, III
The development of S&T and IT infrastructure in Rajasthan spans key historic milestones. Unit 1 of RAPS Rawatbhata was commissioned in 1973, followed by the formal creation of the DST Rajasthan in 1983. Subsequently, the iStart platform was launched in 2017, and the Jan Soochna Portal was introduced in 2019.

www.nodia.in

Click Here to Buy book on Amazon

**107.** (B) Central Electronics Engineering Research Institute (CEERI)
The Central Electronics Engineering Research Institute, located in Pilani, is a premier constituent laboratory of CSIR. The institute specializes in advanced research and technological development in microelectronics, semiconductor devices, microwave tubes, cyber-physical systems, and industrial electronics, contributing significantly to national scientific and technological capabilities.

**108.** (B) Foster innovation and support start-ups in rural Rajasthan
The Rural iStart program extends the state's flagship start-up ecosystem into small towns and rural areas. By providing incubation facilities, mentorship, financial seed grants, and digital infrastructure at the grass-roots level, the initiative encourages rural youth to develop innovative technology-driven solutions tailored to local rural socio-economic challenges.

**109.** (A) Rajasthan State Biotechnology Board / Council
The Rajasthan State Biotechnology Board was established to guide and promote biotechnology applications, research, and industrial development across the state. It formulates policy guidelines, encourages institutional research, facilitates public-private investments, and supports bio-entrepreneurship in agriculture, medicine, environmental conservation, and industrial bio-processing suited to regional arid ecosystems.

**110.** (A) e-Mitra → SSO (Single Sign-On) → Jan Soochna Portal
Rajasthan's key e-governance platforms were launched sequentially to advance digital service delivery. The e-Mitra kiosk network was initiated in 2004, followed by the rollout of the unified Single Sign-On authentication platform in 2013, and subsequently the launch of the Jan Soochna Portal in 2019 for proactive public disclosure.

**111.** (C) 181
The toll-free helpline number 181 is integrated directly with the Rajasthan Sampark portal for public grievance redressal. It allows citizens across the state to register complaints, check file resolution status, and provide feedback regarding various government services and departments verbally through a centralized 24/7 telephonic call centre.

**112.** (C) A major start-up incubator offering co-working space and mentoring
The Bhamashah Techno Hub, located in Jaipur, is one of India's largest government-supported start-up incubators. Spanning extensive plug-and-play operational space, it provides registered entrepreneurs with free co-working facilities, high-speed internet, testing labs, mentorship programs, corporate connections, and direct access to seed funding through the iStart program framework.

**113.** (B) To provide incubation and mentoring to registered start-ups
Under the Rajasthan Start-up Policy, iStart Nest incubators serve as specialized state-run acceleration hubs. Situated across divisional headquarters, these facilities offer registered start-ups free office infrastructure, high-speed connectivity, technical mentoring, legal guidance, investor networking, and administrative assistance to scale their innovative business concepts successfully.

NODIA

**114.** (D) Raj e-Vault
Raj e-Vault, also known as e-Documents, is a secure digital document repository system developed by the Rajasthan Government. It allows citizens and official departments to store, retrieve, and digitally verify official documents, certificates, and licenses online, eliminating physical paperwork and facilitating seamless paperless verification across public service delivery systems.

**115.** (A) I, II and IV
The e-Mitra service network functions on a Public-Private Partnership model to deliver numerous Government-to-Citizen and Business-to-Citizen services. It allows citizens to pay utility bills, apply for official certificates, and access revenue documents. The network is widely spread across all Gram Panchayats rather than being limited to district headquarters.

**116.** (C) Digital study material for school students and teachers
The Raj e-Gyan portal is a web-based educational repository created by the Rajasthan Education Department. It offers free access to a rich collection of digital study materials, e-textbooks, instructional videos, animation modules, and teacher training content mapped to the state

**Reason (R):** Digestion involves the breakdown of complex macro-molecules into simpler, structurally different molecules through enzymatic action.

(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**8.** Which of the following phenomena is LEAST likely to be an indicator that a chemical change has occurred?

(A) The rapid evolution of a gaseous byproduct causing visible bubbling or effervescence in the reaction mixture
(B) A permanent change in colour that cannot be reversed by physical means
(C) The transition of a substance from a solid to a liquid state upon heating
(D) The formation of a solid precipitate when two clear solutions are mixed

**9.** In a chemical change, the total mass of the reactants is equal to the total mass of the products. However, the total energy of the system often changes. How is this energy difference generally manifested?

(A) It is converted directly into additional mass, violating the conservation law slightly.
(B) It is stored entirely as kinetic energy in the nuclei of the product atoms.
(C) It creates a temporary loss of mass until the system returns to room temperature.
(D) It is manifested as the absorption or release of heat, light, or electrical energy.

**10.** Identify the odd one out from the following list of changes, based on their fundamental chemical or physical nature.

(A) Crystallization of copper sulphate from solution
(B) Bacterial souring and coagulation of fresh milk
(C) Slow atmospheric rusting of an exposed iron bridge
(D) Chemical combustion of liquefied petroleum gas (LPG)

**11.** Given below are two statements:

**Statement I:** In a chemical change, the atoms of the reactants are rearranged to form new molecules.

**Statement II:** New atoms are created during a chemical change to account for the new properties of the products.

(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**12.** Consider the following statements regarding the differences between physical and chemical changes:

I. Physical changes only alter physical properties, whereas chemical changes alter chemical composition.
II. Chemical changes are mostly reversible by simple physical means.
III. Energy changes in physical changes are generally much lower than in chemical changes.

Which of the above statement(s) is/are correct?

(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**13.** While comparing physical and chemical changes, which of the following properties remains fundamentally conserved in both types of changes within a closed system?

(A) The exact number and type of atoms
(B) The physical state of the matter
(C) The specific heat capacity of the substances involved
(D) The density of the materials present

**14.** Which of the following represents an incorrect pairing of a process with its classification?

(A) Direct sublimation of solid carbon dioxide (dry ice) – Physical change
(B) Biochemical fermentation of natural grape juice – Chemical change
(C) Magnetization of an iron nail in a magnetic field – Chemical change
(D) Electrolytic decomposition of water into gases – Chemical change

**15.** Match the processes in List I with their corresponding nature of change in List II.

**List I: (Process)**

P. Dissolving sugar in water

Downloaded from www.pdf.tube

Q. Tarnishing of silver
R. Melting of wax
S. Burning of wax

**List II: (Nature of Change)**

1. Chemical change only
2. Physical change involving phase transition
3. Physical change involving mixture formation
4. Surface chemical change

(A) P-2, Q-1, R-3, S-4
(B) P-4, Q-2, R-1, S-3
(C) P-3, Q-1, R-2, S-4
(D) P-3, Q-4, R-2, S-1

**16.** In standard laboratory conditions, which of the following processes requires the rupture of covalent or ionic bonds, thereby distinguishing it from a mere physical change?
(A) The rapid boiling of pure liquid nitrogen into gas
(B) The direct sublimation of solid iodine crystals
(C) The thermal decomposition of calcium carbonate
(D) The complete dissolving of sodium chloride in water

**17.** Which of the following everyday phenomena is exclusively a physical change?
(A) The enzymatic browning and darkening of a freshly cut apple exposed to air
(B) The emission of light by a tungsten filament in an incandescent bulb
(C) The anaerobic biological formation of biogas from animal organic waste
(D) The complex chemical setting and hardening of cement after water addition

**18.** Consider the following statements regarding everyday physical changes:
I. The evaporation of water from lakes involves the breaking of hydrogen bonds between water molecules.
II. When a glass pane shatters, its chemical composition changes slightly due to stress.
III. The cutting of a log of wood into small pieces is an irreversible physical change.
IV. Dissolving carbon dioxide in water under pressure is a purely physical change without any chemical interaction.

Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and IV only
(C) I and III only
(D) I, III, and IV

**19.** A student dissolves a specific amount of common salt (NaCl) in a beaker of water. Which statement best explains why this is primarily classified as a physical change?
(A) The original salt can be recovered chemically unaltered by evaporating the water.
(B) The salt completely loses its chemical properties and atomic structure.
(C) Sodium and chloride ions undergo a redox reaction with water molecules.
(D) The mass of the solution becomes significantly less than the sum of the solute and solvent.

**20.** When solid ammonium chloride ($NH_4Cl$) is heated in a test tube, it converts directly into vapours which then condense on the cooler upper part of the tube. This entire observation is an example of:
(A) Decomposition, which is an irreversible chemical change.
(B) Condensation, which is a chemical change requiring a catalyst.
(C) Sublimation, which is a reversible physical change.
(D) Displacement, which is a physical change driven by heat.

NODIA

**21.** Which of the following physical changes involves an exothermic process?
(A) Condensation of water vapour on a cold glass surface
(B) Rapid melting of a solid block of ice at 0 degrees Celsius
(C) Continuous evaporation of sweat from the human body surface
(D) Direct sublimation of crystalline camphor upon gentle heating

**22.** Identify the odd one out based on the physical or chemical nature of the process involved.
(A) Elastic stretching of a flexible rubber band under tension
(B) Thermal expansion of steel railway tracks during summer heat
(C) Mechanical hammering of a malleable metal into thin sheets
(D) Complete annealing of glass to modify its internal structure

**23.** Which of the following is the correct sequence of events that occurs during the burning of a wax candle?
(A) Solid wax melts → Liquid wax vaporizes → Vapours combust chemically → Heat and

light are produced
(B) Solid wax vaporizes → Vapours melt → Liquid wax combusts chemically → Heat and light are produced
(C) Solid wax combusts chemically → Wax melts → Liquid vaporizes → Heat and light are produced
(D) Solid wax melts → Liquid wax combusts → Vapours are formed → Heat and light are produced

**24.** The souring of milk is considered a chemical change because:
(A) The naturally suspended fat droplets in fresh milk separate out physically from the liquid water phase.
(B) The milk's ambient temperature drops significantly below room level, rapidly changing its physical state.
(C) Bacterial action converts lactose sugar into lactic acid, changing its chemical composition.
(D) The transformation process can be completely and easily reversed simply by boiling the soured milk.

**25.** Which of the following is an exception to the general rule that chemical changes are entirely irreversible by physical means?
(A) Complete combustion and burning of a piece of dry paper into carbon ash
(B) Continuous atmospheric oxidation and rusting of an exposed iron pipe
(C) Enzymatic digestion of complex carbohydrates into simple glucose molecules
(D) Reversible chemical change in a rechargeable lithium-ion battery

**26.** Given below are two statements:
**Statement I:** The ripening of fruits is a chemical change mediated by the gaseous plant hormone ethylene.
**Statement II:** The softening of fruits upon boiling is also a strictly chemical change caused by the complete breakdown of atoms.
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

**27.** Identify the correctly matched pair regarding chemical changes in daily life.
(A) Biological photosynthesis in green plant leaves – Exothermic chemical change
(B) Biological decomposition of organic decay matter – Exothermic chemical change
(C) Cellular respiration in living organisms – Endothermic chemical change
(D) Dissolving solid glucose powder in pure liquid water – Chemical change

**28.** Consider the following processes:
I. The blackening of silverware due to hydrogen sulphide in the air.
II. The formation of a brownish-black layer on a cut potato.
III. The melting of gold to form jewellery.
Which of the above statement(s) is/are chemical changes?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**29.** Arrange the following steps in the correct order to demonstrate a single displacement reaction in a laboratory:
I. Observe the colour of the solution changing from blue to pale green.
II. Take an aqueous solution of copper (II) sulphate in a beaker.
III. Notice the deposition of a reddish-brown layer on the nails.
IV. Clean two iron nails with sandpaper and immerse them in the solution.
(A) II, IV, I, III
(B) IV, II, III, I
(C) II, IV, III, I
(D) IV, III, I, II

**30.** When magnesium ribbon is burned in oxygen, it produces a dazzling white flame and leaves behind a white powder. This reaction is a classic example of:
(A) A decomposition reaction
(B) A double displacement reaction
(C) A combination reaction
(D) A precipitation reaction

**31.** The thermal decomposition of lead (II) nitrate produces lead (II) oxide, oxygen gas, and another gas that manifests as brown fumes. What is the chemical identity of these brown fumes?
(A) Nitric oxide (NO)

Click Here to Buy book on Flipkart

(C) Pepsin
(D) Zymase

**99.** Which of the following is the correct sequence of biochemical stages involved in the industrial production of ethanol from starchy grains?
(A) Fermentation by yeast → Malting (starch to maltose) → Distillation of ethanol → Mashing
(B) Malting (starch to maltose) → Mashing → Fermentation by yeast → Distillation of ethanol
(C) Distillation of ethanol → Fermentation by yeast → Mashing → Malting
(D) Mashing → Distillation → Malting → Fermentation

**100.** During the fermentation of sugar solutions (like grape juice) to produce wine, bubbles of gas are continuously evolved. What is this gas?
(A) Pure oxygen gas
(B) Hydrogen
(C) Carbon dioxide
(D) Methane

**101.** While yeast conducts alcoholic fermentation, certain bacteria (like Lactobacillus) and human muscle cells under heavy strain conduct a different type of fermentation. What is the primary end product of this alternative fermentation pathway?
(A) Lactic acid
(B) Acetic acid
(C) Methanol
(D) Butyric acid

**102.** Match the fermentation products in List I with their primary biological agents or sources in List II.
**List I: (Fermentation Product)**
P. Ethanol (Alcohol)
Q. Curd (Lactic acid)
R. Vinegar (Acetic acid)
S. Biogas (Methane)
**List II: (Biological Agent/Source)**
1. Acetobacter bacteria
2. Yeast (Saccharomyces)
3. Methanogenic bacteria
4. Lactobacillus bacteria
(A) P-4, Q-2, R-3, S-1
(B) P-2, Q-1, R-4, S-3
(C) P-1, Q-4, R-2, S-3
(D) P-2, Q-4, R-1, S-3

**103.** In the process of electrolysis, an electric current is passed through an electrolyte, causing chemical decomposition. What allows the electric current to flow through the electrolyte?
(A) The rapid directional movement of free metallic electrons in the liquid
(B) The movement of mobile positive and negative ions
(C) The rapid physical transport and movement of neutral uncharged atoms
(D) The steady thermal vibration of neutral molecules in a fixed crystalline lattice

**104.** According to Faraday's First Law of Electrolysis, the mass of a substance deposited or liberated at an electrode is directly proportional to:
(A) The average absolute thermodynamic temperature of the liquid electrolyte solution.
(B) The external ambient atmospheric pressure acting directly on the electrolytic cell.
(C) The total quantity of electricity (charge) passed through the electrolyte.
(D) The total geometric volume and liquid level of the electrolytic solution in the bath.

**105.** When acidified water undergoes electrolysis using inert electrodes, hydrogen and oxygen gases are evolved. What is the theoretical ratio of the volume of hydrogen gas collected to the volume of oxygen gas collected?
(A) 1:1
(B) 1:2
(C) 8:1
(D) 2:1

NODIA

**106.** In the industrial application of electroplating an iron spoon with silver, how should the electrolytic cell be assembled?
(A) The iron spoon is made the cathode and a pure silver rod is made the anode.
(B) The iron spoon is made the anode and a pure solid silver rod is made the cathode.
(C) Both the anode and cathode are made of iron in a silver nitrate solution.
(D) The iron spoon is made the cathode in an iron sulphate solution.

**107.** During electrolysis, specific chemical reactions occur at the electrodes. Which statement accurately describes these reactions?
(A) Oxidation occurs at the cathode, and reduction occurs at the anode.
(B) Reduction occurs at the cathode, and oxidation occurs at the anode.

**41.** Match the redox terms in List I with their accurate definitions in List II.

**List I: (Term)**

P. Oxidation
Q. Reduction
R. Oxidizing Agent
S. Reducing Agent

**List II: (Definition)**

1. A substance that donates electrons to another substance
2. The process of losing electrons
3. The process of gaining electrons
4. A substance that accepts electrons from another substance

(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-1, S-4
(C) P-3, Q-2, R-4, S-1
(D) P-2, Q-3, R-4, S-1

**42.** In the chemical reaction: $CuO + H_2 \rightarrow Cu + H_2O$, which substance undergoes reduction and which acts as the reducing agent, respectively?
(A) CuO undergoes reduction; $H_2$ is the reducing agent.
(B) CuO undergoes reduction; CuO is the reducing agent.
(C) $H_2$ undergoes reduction; CuO is the reducing agent.
(D) $H_2$ undergoes reduction; $H_2$ is the reducing agent.

**43.** From the perspective of modern electronic theory, how is oxidation defined in a chemical reaction?
(A) A chemical process involving a significant decrease in the overall oxidation state of an element
(B) A process involving the complete transfer or loss of electrons by an atom or ion
(C) A chemical process involving the net gain or uptake of electrons by a reacting atom or ion
(D) A chemical process strictly involving the removal or extraction of combined oxygen atoms only

**44.** Consider the following statements about redox reactions:
I. Oxidation and reduction always occur simultaneously in a chemical reaction.
II. The substance getting oxidized acts as the reducing agent.
III. Rusting of iron is a classic example of a redox reaction.
IV. In a redox reaction, the total number of electrons lost equals the total number of electrons gained.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

NODIA

**45.** Hydrogen peroxide ($H_2O_2$) can decompose into water ($H_2O$) and oxygen gas ($O_2$). In this reaction, oxygen within the $H_2O_2$ molecule undergoes both oxidation and reduction simultaneously. What is the specific term for this type of redox reaction?
(A) Disproportionation reaction
(B) Displacement reaction
(C) Neutralization reaction
(D) Synproportionation reaction

**46.** In the metallurgical process of smelting, a metal oxide is heated with carbon (coke) to extract the pure metal. What is the primary role of carbon in this process?
(A) It acts primarily as a chemical catalyst to speed up the melting point of the metal ore.
(B) It acts directly as an oxidizing agent, providing additional oxygen to the metal atoms.
(C) It acts as a reducing agent, removing oxygen from the metal oxide.
(D) It acts as an inorganic chemical flux to react with and remove unwanted gangue as slag.

**47.** In chemical thermodynamics, the enthalpy change ($\Delta H$) of a reaction indicates whether it is exothermic or endothermic. Which of the following accurately describes an endothermic reaction?
(A) $\Delta H$ is negative, and the system absorbs heat from the surroundings.
(B) $\Delta H$ is negative, and the system releases heat to the surroundings.
(C) $\Delta H$ is positive, and the system releases heat to the surroundings.
(D) $\Delta H$ is positive, and the system absorbs heat from the surroundings.

**48.** When solid ammonium nitrate is dissolved in a beaker of water, the temperature of the beaker feels noticeably colder to the touch. This phenomenon indicates that the dissolution process is:
(A) Exothermic, because thermal energy is continuously escaping outwards into the observer's hand.

**79.** Certain specific liquid mixtures, like a 95.6% ethanol and 4.4% water mixture, boil at a constant temperature and cannot be completely separated by simple fractional distillation. What is the technical term for such mixtures?
(A) Isomeric mixtures
(B) Supersaturated solutions
(C) Colloidal emulsions
(D) Azeotropic mixtures

**80.** The reactivity series of metals ranks metals by their tendency to lose electrons. Based on this series, which of the following metals is the most reactive and typically stored under oil to prevent explosive reactions with air and water?
(A) Iron (Fe)
(B) Copper (Cu)
(C) Potassium (K)
(D) Magnesium (Mg)

**81.** According to the reactivity series, a metal can displace hydrogen from a dilute acid only if:
(A) The metal is placed below hydrogen in the reactivity series.
(B) The metal is placed above hydrogen in the reactivity series.
(C) The metal is a noble metal like gold or platinum.
(D) The metal is highly electronegative.

**82.** Which of the following non-metals is highly reactive in air, catches fire spontaneously at room temperature, and is therefore stored underwater?
(A) Elemental sulphur
(B) Carbon
(C) Iodine
(D) White phosphorus

**83.** When a highly reactive metal like sodium reacts vigorously with cold water, it produces a basic solution and a combustible gas. What is the correct chemical equation for this reaction?
(A) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
(B) $Na + H_2O \rightarrow NaO + H_2$
(C) $2Na + H_2O \rightarrow Na_2O + H_2$
(D) $Na + 2H_2O \rightarrow NaOH_2 + O_2$

**84.** When non-metals react with oxygen, they typically form oxides. What is the general nature of most non-metal oxides when dissolved in water?
(A) Strongly basic
(B) Amphoteric
(C) Acidic
(D) Completely inert

**85.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Iron objects rust rapidly in highly humid coastal areas compared to dry desert areas.
**Reason (R):** The chemical process of rusting requires the simultaneous presence of both oxygen and moisture (water).
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**86.** The reddish-brown flaky substance that forms on the surface of iron during rusting is a complex hydrated compound. What is its widely accepted general chemical formula?
(A) $FeO.xH_2O$
(B) $Fe3O_4.xH_2O$
(C) Fe(OH)2
(D) $Fe_2O_3.xH_2O$

**87.** To prevent iron structures from rusting, they are often coated with a layer of a more reactive metal, such as zinc. What is the specific industrial name for this protective process?
(A) Anodizing
(B) Galvanization
(C) Vulcanization
(D) Electroplating

**88.** In underground pipelines or ship hulls, blocks of magnesium or zinc are often attached to the iron structure. These blocks corrode preferentially, saving the iron. What is this electrochemical method of corrosion prevention called?
(A) Impermeable non-reactive barrier surface protection
(B) Chemical surface passivation coating technique
(C) Cathodic protection (sacrificial protection)
(D) Homogeneous metallurgical alloying process

**89.** Consider the following statements regarding the corrosion of various metals:
I. The green coating on copper exposed to damp air is basic copper carbonate.
II. Silver items turn black due to the formation

Downloaded from www.pdf.tube

(D) Enzymes are substrate-specific and operate best within narrow pH and temperature ranges.

**55.** In industrial chemistry, substances are sometimes added alongside a catalyst to enhance or inhibit its efficiency. What are substances that decrease the activity of a catalyst called?
(A) Catalytic promoters or activity enhancers
(B) Inhibitors or catalytic poisons
(C) Organic co-enzymes and co-factors
(D) Kinetic reaction accelerators

**56.** In the context of heterogeneous catalysis, where the catalyst is in a different physical state than the reactants, which step is generally considered crucial for the reaction mechanism?
(A) The complete dissolution of the solid catalyst into the liquid reactants.
(B) The vaporization of the catalyst to mix with gaseous reactants.
(C) The adsorption of reactant molecules onto the surface of the catalyst.
(D) The formation of a permanent covalent compound between the catalyst and the product.

**57.** The balancing of a chemical equation fundamentally relies on aligning the number of atoms of each element on the reactant side with those on the product side. This procedure satisfies which fundamental scientific law?
(A) Law of Definite Proportions
(B) Law of Multiple Proportions
(C) Avogadro's Hypothesis or Law
(D) Law of Conservation of Mass

**58.** Consider the unbalanced chemical equation: a Fe + b $H_2O$ → c $Fe3O_4$ + d $H_2$. What are the correct integer values for the stoichiometric coefficients a, b, c, and d, respectively?
(A) 3, 4, 1, 4
(B) 3, 2, 1, 2
(C) 2, 3, 1, 3
(D) 1, 1, 1, 1

**59.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** A balanced chemical equation must always have whole-number stoichiometric coefficients for its final representation.
**Reason (R):** Atoms cannot be divided into fractions during a standard chemical reaction.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**60.** When balancing the combustion reaction of a hydrocarbon like ethane ($C_2H_6$) with oxygen ($O_2$) to form $CO_2$ and $H_2O$, which element's atoms are conventionally balanced last?
(A) Carbon, because it constitutes the core chemical backbone of the organic hydrocarbon reactant molecule.
(B) Oxygen, because it appears in multiple products and as a diatomic molecule in the reactants.
(C) Hydrogen, because it is present within both the reactant hydrocarbon and the resulting water vapor product.
(D) Any element can be balanced last, as the balancing order never affects the final mathematical coefficients.

**61.** While a balanced chemical equation provides crucial stoichiometric information, which of the following is an inherent limitation of a standard balanced chemical equation?
(A) It does not reveal physical states of substances unless explicitly annotated.
(B) It fails to provide or indicate the correct molecular formulae of the participating reactants and products.
(C) It fails to show or quantify the relative molar ratios and mole numbers of the reactants and products present.
(D) It violates fundamental laws by failing to abide by the principle of mass conservation in a system.

**62.** The Law of Conservation of Mass was formulated by which pioneering chemist, often referred to as the "Father of Modern Chemistry"?
(A) English chemist John Dalton
(B) Dmitri Mendeleev
(C) Antoine Lavoisier
(D) Robert Boyle

**63.** To accurately verify the Law of Conservation of Mass experimentally during a chemical reaction that produces a gas, what critical condition must the experimental setup meet?
(A) The reaction must be carried out continuously in an open laboratory crucible.

NODIA

(B) Isothermal, because surrounding water maintains a completely constant thermodynamic heat capacity.
(C) Endothermic, because the system absorbs thermal energy from its surroundings.
(D) Catalytic, because liquid water acts as a catalyst to speed up the chemical breakdown of salt.

**49.** How do the activation energy requirements of exothermic and endothermic reactions generally compare, and what dictates the overall energy release?
(A) Exothermic reactions proceed spontaneously with zero activation energy required, whereas endothermic reactions demand substantial activation energy.
(B) Both require activation energy; in exothermic reactions, energy released forming products exceeds activation energy input.
(C) Endothermic reactions inherently release a much larger amount of activation energy during bond formation than they initially consume.
(D) Activation energy is thermodynamically identical and synonymous with the total enthalpy change ($\Delta H$) measured for a chemical reaction.

**50.** Which of the following is the correct sequence of energy phases during a typical exothermic chemical reaction profile as mapped on a potential energy diagram?
(A) Energy of reactants → Energy absorbed to reach transition state → Energy released forming products → Energy of products (lower than reactants)
(B) Energy of reactants → Energy released to reach transition state → Energy absorbed forming products → Energy of products (higher than reactants)
(C) Energy of products → Energy absorbed to reach transition state → Energy released forming reactants → Energy of reactants (higher than products)
(D) Energy of reactants → Continuous steady decrease in overall kinetic energy → Energy of products formed without any activation energy phase

**51.** Cellular respiration is a fundamental biological process where glucose reacts with oxygen to form carbon dioxide, water, and ATP. Why is respiration classified as an exothermic process?
(A) Because it involves the breakdown of complex molecules, which inherently releases energy.
(B) Because it strictly requires a continuous input of external heat to proceed.
(C) Because the chemical bonds in the products contain more energy than the bonds in the reactants.
(D) Because it cools down the cellular environment to maintain homeostasis.

**52.** Which of the following statements most accurately describes the fundamental role of a positive catalyst in a chemical reaction?
(A) It significantly increases the overall yield and total amount of products formed at chemical equilibrium.
(B) It increases the average kinetic energy and thermal speed of all colliding reactant molecules in the mixture.
(C) It provides an alternative reaction pathway with a lower activation energy.
(D) It actively participates in the elementary chemical steps and becomes completely consumed by the end.

**53.** In a reversible chemical reaction at equilibrium, what effect does the addition of a catalyst have on the system?
(A) It increases the rates of forward and backward reactions equally, preserving equilibrium.
(B) It permanently shifts the dynamic chemical equilibrium position far toward the side of the formed products.
(C) It steadily shifts the dynamic chemical equilibrium position back toward the side of the starting reactants.
(D) It selectively increases the kinetic rate of the forward reaction while leaving the reverse reaction unaffected.

**54.** Enzymes are complex protein molecules that act as highly efficient catalysts in biochemical reactions. Which of the following is a key characteristic that distinguishes enzymes from typical inorganic catalysts?
(A) Enzymes function efficiently across extreme physical environments and extremely high temperatures well above 100°C.
(B) Enzymes are completely non-specific biological molecules capable of catalyzing a wide variety of unrelated reactions.
(C) Enzymes function by significantly increasing the overall activation energy barrier of the biochemical reactions they mediate.

Click Here to Buy book on Amazon

requiring intense thermal input.
(B) Evaporation occurs below boiling point at the surface, whereas boiling occurs at a fixed temperature throughout the bulk.
(C) Evaporation happens uniformly throughout the bulk liquid volume, while boiling is entirely restricted to being a superficial surface phenomenon.
(D) Evaporation requires a constant external heat source to proceed, whereas boiling occurs completely spontaneously without any added heat energy.

**72.** In thermodynamics, there is a specific temperature and pressure at which the solid, liquid, and gaseous phases of a given substance can coexist in stable thermodynamic equilibrium. What is this point called?
(A) Critical point
(B) Boiling point
(C) Triple point
(D) Sublimation point

**73.** Which of the following substances undergoes sublimation at standard atmospheric pressure when heated gently?
(A) Sodium chloride
(B) Silicon dioxide
(C) Copper sulphate
(D) Naphthalene

**74.** Which fundamental chemical law dictates that a pure chemical compound always contains its constituent elements combined together in a fixed ratio by mass, distinguishing it from a mixture?
(A) Law of Definite Proportions
(B) Law of Multiple Proportions
(C) Law of Conservation of Mass
(D) Gay-Lussac's Law of Gaseous Volumes

**75.** A key difference between a mixture and a compound lies in the properties of the final substance. Which of the following statements correctly highlights this difference?
(A) A compound always exhibits the exact combined physical and chemical properties of its constituent elements, whereas a mixture forms entirely new unique properties.
(B) A mixture retains the properties of its constituents, whereas a compound exhibits distinct new chemical properties.
(C) Both mixtures and compounds fully retain all original physical properties of their constituent substances, but differ strictly in their thermal capacities.
(D) Chemical compounds can easily be separated using simple physical methods, whereas simple mixtures strictly require complex chemical reactions for separation.

**76.** When iron filings and sulphur powder are mixed together at room temperature, the resulting material is classified as a mixture. However, when this mixture is strongly heated, it forms a compound, Iron (II) sulphide (FeS). Which action best differentiates the mixture from the compound in a laboratory setting?
(A) Dissolving both materials in cold distilled water; the mixture dissolves completely but the chemical compound remains insoluble.
(B) Passing a magnet over both; it will attract iron from the mixture but not from the compound.
(C) Weighing both samples on a digital balance; the compound weighs significantly less than the original unheated mixture.
(D) Adding phenolphthalein indicator solution to both; the physical mixture immediately turns a bright pink color.

NODIA

**77.** Match the specific type of mixture in List I with its correct everyday example in List II.
**List I: (Type of Mixture)**
P. Solid in Liquid (Homogeneous)
Q. Liquid in Liquid (Emulsion)
R. Gas in Liquid (Solution)
S. Solid in Gas (Aerosol)
**List II: (Example)**
1. Smoke
2. Carbonated water
3. Milk
4. Sugar in water
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-3, R-2, S-4

**78.** Alloys, such as brass (copper and zinc) and bronze (copper and tin), are highly useful materials in engineering. Chemically speaking, how are standard solid alloys classified?
(A) As pure chemical compounds with definite chemical formulae
(B) As heterogeneous mixtures
(C) As homogeneous mixtures (solid solutions)
(D) As colloidal dispersions

(B) Nitrous oxide ($N_2O$)
(C) Dinitrogen tetroxide ($N_2O_4$)
(D) Nitrogen dioxide ($NO_2$)

**32.** In a single displacement reaction, zinc granules are added to dilute hydrochloric acid. Which of the following gases is evolved, and how can its presence be tested?
(A) Oxygen gas; it rapidly reignites a glowing wooden splint.
(B) Carbon dioxide gas; it turns clear lime water milky white.
(C) Hydrogen; it burns with a characteristic 'pop' sound.
(D) Chlorine gas; it rapidly bleaches moist blue litmus paper.

**33.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Copper metal cannot displace zinc from an aqueous solution of zinc sulphate.
**Reason (R):** Copper is placed lower than zinc in the electrochemical reactivity series.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**34.** Silver chloride, when placed in direct sunlight, turns grey. This is due to its photolytic decomposition into silver metal and chlorine gas. Such reactions are primarily utilized in which of the following applications?
(A) Manufacturing of bleaching powder
(B) Water purification processes
(C) Extraction of silver from its ores in blast furnaces
(D) Black and white photography

**35.** Which of the following equations accurately represents a double displacement reaction?
(A) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
(B) $2H_2 + O_2 \rightarrow 2H_2O$
(C) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
(D) $CaCO_3 \rightarrow CaO + CO_2$

**36.** In the context of chemical reactions, what precisely defines a precipitation reaction?
(A) A chemical reaction where two solid reactants dissolve and form a pure liquid product upon heating.
(B) A chemical reaction where a gas reacts with a liquid medium to form a supersaturated ionic solution.
(C) A reaction where mixing aqueous solutions forms an insoluble solid product.
(D) A chemical change that is triggered solely by the continuous application of extremely high pressure.

**37.** When aqueous solutions of potassium iodide and lead (II) nitrate are mixed, a precipitate forms. What are the colour and chemical identity of this precipitate?
(A) Yellow; Lead (II) iodide
(B) White; Lead (II) nitrate
(C) Yellow; Potassium nitrate
(D) White; Lead (II) iodide

**38.** Consider the following characteristics regarding double displacement reactions:
I. They involve an exchange of ions between the reactants.
II. They typically occur between ionic compounds in aqueous solutions.
III. They always result in the evolution of a combustible gas.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**39.** The reaction between an acid and a base to form salt and water is classically termed a neutralization reaction. Fundamentally, neutralization is a specific type of which chemical reaction?
(A) Direct combination synthesis reaction
(B) Double displacement reaction
(C) Thermal decomposition reaction
(D) Photochemical light reaction

**40.** In the precipitation reaction between aqueous sodium chloride and aqueous silver nitrate, sodium ions ($Na^+$) and nitrate ions ($NO_3$-) remain dissolved in the solution before and after the reaction. What is the specific chemical term for such ions?
(A) Reactive ions
(B) Catalytic ions
(C) Spectator ions
(D) Precipitating ions

Downloaded from www.pdf.tube

of silver sulphide.
III. Aluminum corrodes endlessly until the entire object is destroyed, much like iron.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**90.** From a modern chemical perspective, the rusting of iron is fundamentally best described as:
(A) An electrochemical cell process involving oxidation at the anode and reduction at the cathode.
(B) A simple thermal combination chemical reaction driven entirely by high ambient heat.
(C) A purely reversible physical phase change process triggered by atmospheric water vapor.
(D) A standard chemical neutralization reaction occurring between acidic iron and basic liquid water.

**91.** When a hydrocarbon fuel burns in a limited supply of oxygen, it undergoes incomplete combustion. Aside from water, which hazardous, colorless, and odorless gas is primarily produced during this process?
(A) Carbon dioxide ($CO_2$)
(B) Carbon monoxide (CO)
(C) Sulphur dioxide ($SO_2$)
(D) Nitrogen dioxide ($NO_2$)

**92.** The efficiency of a fuel is often judged by the amount of heat energy produced on complete combustion of 1 kg of that fuel. What is the technical term for this measurement?
(A) Activation energy
(B) Calorific value
(C) Specific heat capacity
(D) Enthalpy of vaporization

**93.** Every combustible substance requires a minimum temperature to catch fire and start burning. What is this critical temperature called?
(A) Ignition temperature
(B) Boiling point
(C) Flash point
(D) Critical system temperature

**94.** A Bunsen burner flame can be adjusted by opening or closing the air hole. When the air hole is fully open, the burner produces a blue, non-luminous flame. This indicates:
(A) Incomplete combustion due to a lack of oxygen.
(B) The presence of unburnt carbon particles glowing in the flame.
(C) Complete combustion due to an adequate supply of oxygen.
(D) The flame temperature is much lower than a yellow flame.

**95.** Consider the following statements regarding combustion and fire extinguishing:
I. Water cannot be used to extinguish oil fires because oil is lighter than water and floats, continuing to burn.
II. Carbon dioxide is an excellent fire extinguisher for electrical fires because it does not conduct electricity.
III. Dry powder extinguishers often release carbon dioxide when heated by the fire.
IV. Combustion can occur without oxygen if a stronger oxidizing agent like chlorine is present.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, II, III, and IV

NODIA

**96.** Certain substances like white phosphorus can suddenly burst into flames without the application of any apparent external heat. What is this type of combustion known as?
(A) Rapid external combustion
(B) Explosion
(C) Spontaneous combustion
(D) Smouldering

**97.** Fermentation is fundamentally a biological and chemical process. Which of the following conditions is strictly necessary for standard alcoholic fermentation by yeast to occur?
(A) High pressure and presence of oxygen
(B) Anaerobic conditions (absence of oxygen)
(C) Presence of strong inorganic acids
(D) Extremely high temperatures (above 100°C)

**98.** Which specific enzyme complex, naturally secreted by yeast cells, catalyzes the chemical conversion of glucose into ethanol and carbon dioxide during fermentation?
(A) Amylase
(B) Lipase

(B) The reaction must be subjected to heating at an extremely high temperature.
(C) The reaction must take place entirely inside an evacuated glass vacuum chamber.
(D) The reaction must occur within a completely closed and sealed system.

**64.** Consider the following statements regarding the Law of Conservation of Mass in practical chemistry:
I. It implies that the total mass of reactants consumed equals the total mass of products formed.
II. It holds perfectly true for standard chemical reactions but not for nuclear reactions where mass-energy equivalence applies.
III. It dictates that the number of molecules must remain constant before and after a reaction.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**65.** In the highly specialized context of nuclear reactions (such as fission or fusion), the strict classical Law of Conservation of Mass appears to be violated. What accounts for the "missing" mass (mass defect) in these reactions?
(A) It is completely destroyed at a fundamental level and ceases to exist anywhere in the universe.
(B) It is converted into energy according to Einstein's equation $E=mc^2$.
(C) It gets completely absorbed by the surrounding atmospheric air molecules during the nuclear process.
(D) It escapes rapidly into deep space in the form of completely undetectable dark matter particles.

**66.** Landolt's experiment, utilizing an H-shaped glass tube, is historically significant for demonstrating which fundamental chemical principle?
(A) The Law of Multiple Proportions
(B) The presence of electrons in an atom
(C) The specific heat capacity of liquids
(D) The Law of Conservation of Mass

**67.** If 10 grams of calcium carbonate ($CaCO_3$) is completely decomposed by heating, it produces 5.6 grams of calcium oxide (CaO). According to the Law of Conservation of Mass, what mass of carbon dioxide ($CO_2$) gas is produced?
(A) 4.4 grams
(B) 5.6 grams
(C) 10.0 grams
(D) 15.6 grams

**68.** Arrange the following phase changes in the correct sequence as a block of ice at -10°C is steadily heated until it becomes steam at 110°C.
I. The liquid water absorbs sensible heat until it reaches 100°C.
II. The ice absorbs heat and melts into liquid water at 0°C.
III. The water vaporizes into steam at 100°C.
IV. The ice absorbs sensible heat until it reaches 0°C.
(A) IV, II, I, III
(B) II, IV, I, III
(C) IV, I, II, III
(D) I, II, III, IV

**69.** During the melting of a solid into a liquid at its melting point, heat is continuously supplied, yet the temperature of the substance does not rise. What is the specific term for the heat energy absorbed during this phase change?
(A) Latent heat of fusion
(B) Specific heat capacity
(C) Latent heat of vaporization
(D) Sensible heat

**70.** Consider the following statements about the kinetic theory of matter during a change of state:
I. During boiling, the kinetic energy of the molecules increases exponentially.
II. During melting, the supplied heat is used to overcome the intermolecular forces of attraction.
III. Evaporation can occur at temperatures below the boiling point of the liquid.
IV. Freezing involves a decrease in the average kinetic energy of the particles.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, and IV only

**71.** What is the fundamental difference between the physical processes of evaporation and boiling?
(A) Evaporation is strictly an exothermic physical process that releases heat, whereas boiling is exclusively an endothermic process

Click Here to Buy book on Flipkart

(C) Both oxidation and reduction occur simultaneously at the anode.
(D) Neutralization occurs at the cathode, and displacement at the anode.

**108.** The electrolysis of molten sodium chloride produces sodium metal and chlorine gas. However, the electrolysis of aqueous sodium chloride (brine) produces chlorine gas, sodium hydroxide, and another gas. What is this other gas?
(A) Oxygen
(B) Hydrogen
(C) Hydrogen chloride
(D) Sodium vapour

**109.** In a closed system, a reversible chemical reaction eventually reaches a state of dynamic equilibrium. What precisely defines this state?
(A) The rate of the forward reaction equals the rate of the backward reaction.
(B) The molar concentrations of the reactants and products become exactly equal to each other.
(C) The chemical reaction completely halts and stops proceeding at a microscopic molecular level.
(D) All starting reactants have been completely and quantitatively converted into final products.

**110.** Which famous chemical principle states that if a dynamic equilibrium is disturbed by changing conditions (such as temperature, pressure, or concentration), the position of equilibrium shifts to counteract the change?
(A) Avogadro's Hypothesis or Principle
(B) Heisenberg's Principle
(C) Le Chatelier's Principle
(D) Boyle's Law

**111.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** The phase transition of ice melting into water is a reversible change.
**Reason (R):** The liquid water can be frozen back into ice by lowering the temperature below its freezing point without altering its chemical composition.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**112.** Why is the combustion of a piece of wood classified as a strictly irreversible chemical change under standard atmospheric conditions?
(A) The thermal heat energy produced during burning cannot easily be captured or contained within a practical closed thermodynamic system.
(B) Wood is a highly variable heterogeneous organic mixture rather than a chemically uniform pure compound with a single molecular structure.
(C) Formed ashes and gaseous products cannot spontaneously recombine to reform complex wood polymers.
(D) The underlying physical state of the matter changes directly from solid to ionized plasma, which inherently cannot be reversed.

**113.** The thermal decomposition of calcium carbonate ($CaCO_3 \rightarrow CaO + CO_2$) can be either reversible or irreversible depending entirely on the experimental setup. Under what condition does this reaction become reversible?
(A) When the decomposition reaction is carried out in an open vessel where $CO_2$ gas can freely escape.
(B) When it is carried out in a closed vessel where $CO_2$ cannot escape.
(C) When the reaction process is maintained and carried out exclusively at extremely low temperatures.
(D) When a concentrated strong inorganic acid is actively added to react with the starting material.

**114.** Most natural, spontaneous chemical processes in the universe, such as the rusting of an abandoned car or the burning of a forest, possess a specific directionality governed by the Second Law of Thermodynamics. These processes are inherently:
(A) Fully reversible thermodynamic processes
(B) Isothermal processes
(C) Equilibrium processes
(D) Irreversible processes

**115.** Consider the following statements regarding the role of energy in chemical reactions:
I. Breaking chemical bonds in reactant molecules always requires an input of energy.
II. Forming new chemical bonds in product

Downloaded from www.pdf.tube

compound that precipitates out of solution as a bright yellow solid, while potassium nitrate remains dissolved as spectator ions in solution.

**38.** (A) I and II only
Double displacement reactions primarily occur between ionic species in aqueous medium and involve a mutual exchange of constituent ions to form precipitates, gases, or weak electrolytes. However, they do not universally evolve combustible gas products; many produce neutral water or solid precipitates. Thus, statements I and II are correct, while statement III is inaccurate.

**39.** (B) Double displacement reaction
Neutralization reactions between acids and bases produce water and a salt through the exchange of hydrogen and hydroxide ions. Hydrogen ions from the acid combine with hydroxide ions from the base, while remaining cations and anions pair together, representing a classic ionic exchange characteristic of double displacement chemical reactions.

**40.** (C) Spectator ions
In aqueous precipitation reactions, spectator ions are chemical species that remain dissolved in the solvent throughout the reaction without undergoing chemical transformation or participating directly in precipitate formation. In the reaction between sodium chloride and silver nitrate, sodium and nitrate ions exist as dissolved ions before and after the precipitation of silver chloride.

**41.** (D) P-2, Q-3, R-4, S-1
According to modern electron transfer theory, oxidation represents electron loss while reduction represents electron gain. An oxidizing agent accepts electrons from another reactant, thereby causing its oxidation. A reducing agent donates electrons to another species, facilitating its reduction. Aligning these fundamental electrochemical definitions matches the specified numbered definitions in order.

**42.** (A) CuO undergoes reduction; $H_2$ is the reducing agent.
In the reaction between copper oxide and hydrogen gas, copper oxide loses oxygen atoms to yield metallic copper, meaning copper oxide undergoes reduction. Concurrently, hydrogen gas gains oxygen atoms to form water, acting as the reducing agent by accepting oxygen and donating electrons to facilitate the reduction of copper oxide.

**43.** (B) A process involving the complete transfer or loss of electrons by an atom or ion
Under modern electronic oxidation-reduction theory, oxidation is defined broadly as a chemical process where an atom, molecule, or ion loses one or more electrons. This loss of electrons results in an increase in the overall oxidation state of the species, irrespective of whether oxygen atoms are directly involved in the chemical reaction.

**44.** (D) I, II, III, and IV
Oxidation and reduction occur simultaneously because electron loss by one species must equal electron gain by another. The oxidized substance functions as the reducing agent by donating electrons. Rusting is an electrochemical redox process involving iron oxidation. Conservation of electric charge mandates that total electrons lost equal total electrons gained in all reactions.

NODIA

**45.** (A) Disproportionation reaction
A disproportionation reaction is a specialized type of redox process in which atoms of a single element contained within a single reactant species undergo simultaneous oxidation and reduction. In hydrogen peroxide decomposition, oxygen atoms with an oxidation state of -1 are simultaneously oxidized to elemental oxygen (0) and reduced to water (-2).

**46.** (C) It acts as a reducing agent, removing oxygen from the metal oxide.
In metallurgical smelting, carbon in the form of coke serves as a chemical reducing agent. When heated with metal oxides, carbon abstracts oxygen atoms from the metal compound to form carbon monoxide or carbon dioxide gas, leaving behind purified elemental metal. Carbon undergoes oxidation while reducing the metal oxide.

**47.** (D) $\Delta H$ is positive, and the system absorbs heat from the surroundings.
An endothermic reaction absorbs heat energy from its surrounding environment to drive the reaction forward. Because the total thermodynamic enthalpy of the products exceeds the enthalpy of the starting reactants, the change in enthalpy ($\Delta H$) carries a positive

is added to the charge. What is the primary chemical function of the limestone in this industrial process?
(A) It acts directly as a primary reducing agent to convert solid iron oxide into pure molten iron.
(B) It decomposes to form CaO, which reacts with silica impurities to form a molten slag.
(C) It functions as a heterogeneous chemical catalyst to lower the activation temperature for smelting.
(D) It supplies supplementary oxygen gas to ensure the thorough and complete combustion of coke fuel.

**125.** Natural rubber is soft and sticky, making it unsuitable for manufacturing tires. It is chemically modified by heating it with sulphur to form cross-links between polymer chains, improving its strength and elasticity. What is this industrial chemical change called?
(A) Vulcanization
(B) Polymerization
(C) Galvanization
(D) Saponification

**126.** Match the physical separation techniques in List I with the appropriate mixtures they are used to separate in List II.
**List I: (Separation Technique)**
P. Fractional Distillation
Q. Centrifugation
R. Chromatography
S. Sublimation
**List II: (Mixture)**
1. Separating butter from cream
2. Separating different pigments in ink
3. Separating liquid air into nitrogen and oxygen
4. Separating a mixture of camphor and salt
(A) P-1, Q-3, R-2, S-4
(B) P-3, Q-2, R-1, S-4
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-1, R-4, S-3

**127.** Chromatography is a versatile laboratory technique used to separate and identify components of complex mixtures. The separation is primarily based on the differences in which physical property of the components?
(A) Significant differences in their respective boiling points under standard pressure.
(B) Variations in their physical particle densities and differential response to centrifugal force.
(C) Distinct magnetic properties and susceptibility when exposed to a moving organic solvent.
(D) Differential partitioning between a stationary and a mobile phase.

**128.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Simple distillation can be effectively used to separate a liquid mixture of acetone (boiling point 56°C) and water (boiling point 100°C).
**Reason (R):** Simple distillation is suitable for separating miscible liquids that boil without decomposition and have a sufficient difference (usually greater than 25°C) in their boiling points.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**129.** When blood is rapidly spun in a laboratory machine, the heavier red blood cells settle at the bottom of the tube while the lighter plasma remains at the top. What is this physical method of separation called?
(A) Filtration
(B) Centrifugation
(C) Decantation
(D) Reverse Osmosis

**130.** In industrial waste management, huge electromagnets are sometimes suspended over conveyor belts carrying mixed municipal solid waste. This setup utilizes a physical property to separate which highly recyclable metal from the mixture?
(A) Aluminum
(B) Copper
(C) Lead
(D) Iron

**131.** The burning of fossil fuels releases gases that undergo chemical changes in the atmosphere, leading to acid rain. Which two primary gases are responsible for the formation of acid rain?
(A) Sulphur dioxide and Nitrogen dioxide
(B) Carbon monoxide and Methane
(C) Ozone and Chlorofluorocarbons
(D) Atmospheric carbon dioxide and hydrogen

Click Here to Buy book on Amazon

molecules always releases energy.
III. If the energy released during bond formation is greater than the energy absorbed during bond breaking, the overall reaction is endothermic.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**116.** Photosynthesis in plants and the decomposition of silver bromide in photographic films are both examples of chemical changes driven by specific energy inputs. What type of reactions are these?
(A) Thermochemical reactions
(B) Electrochemical reactions
(C) Photochemical reactions
(D) Mechanochemical reactions

**117.** The Thermite reaction, used for welding railway tracks, involves the highly exothermic reaction between iron (III) oxide and aluminum powder. What is the primary form of energy released that makes this reaction so industrially useful?
(A) Intense thermal energy (heat) capable of melting iron
(B) High-voltage directed electrical discharge energy
(C) Coherent high-intensity ultraviolet photon light energy
(D) High-decibel acoustic and mechanical sound wave energy

**118.** Some chemical reactions, such as the reaction inside a glow stick or the bioluminescence of a firefly, release energy primarily in the form of light with very little heat. What is the specific term for this phenomenon?
(A) Optical fluorescence
(B) Phosphorescence
(C) Incandescence
(D) Chemiluminescence

**119.** In a galvanic (voltaic) cell, such as a standard alkaline battery, what specific energy transformation takes place due to the spontaneous chemical changes within the cell?
(A) Electrical energy is converted into chemical energy.
(B) Chemical energy is converted into electrical energy.
(C) Thermal heat energy is directly converted into usable electrical energy.
(D) Mechanical energy is converted into chemical energy.

**120.** In the industrial synthesis of ammonia via the Haber-Bosch process, nitrogen and hydrogen gases react at high pressure and temperature. Which catalyst is traditionally employed to increase the rate of this vital chemical change?
(A) Solid vanadium (V) oxide catalyst
(B) Platinum mesh
(C) Finely divided iron
(D) Nickel powder

**121.** Consider the following statements regarding the Contact process for the industrial manufacture of sulphuric acid:
I. Sulphur dioxide is oxidized to sulphur trioxide in the presence of a vanadium (V) oxide catalyst.
II. The oxidation of $SO_2$ to $SO_3$ is a reversible and highly endothermic reaction.
III. Sulphur trioxide is directly absorbed into water to safely produce concentrated sulphuric acid.
IV. Sulphur trioxide is absorbed into concentrated sulphuric acid to form oleum, which is then diluted.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and IV only
(C) II and III only
(D) I, III, and IV

NODIA

**122.** The Solvay process is a major industrial chemical process used primarily for the large-scale production of which commercially important compound?
(A) Sodium carbonate (Washing soda)
(B) Sodium hydroxide (Caustic soda)
(C) Calcium hypochlorite (Bleaching powder)
(D) Ammonium nitrate (Fertilizer)

**123.** The separation of crude oil into useful fractions like petrol, diesel, and kerosene in a petroleum refinery is based on which fundamental physical property of the hydrocarbons?
(A) Differences in their magnetic susceptibilities
(B) Differences in their boiling points
(C) Differences in their chemical reactivities with water
(D) Differences in their freezing points

**124.** In the extraction of iron from hematite ore using a blast furnace, calcium carbonate (limestone)

(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

**140.** In analytical chemistry, a flame test is used to identify the presence of certain metal ions based on the emission spectrum (color) they impart to a Bunsen flame. Which metal ion gives a characteristic apple-green flame?
(A) Sodium
(B) Barium
(C) Potassium
(D) Copper

www.nodia.in

Downloaded from www.pdf.tube

# ANSWERS

**1.** (B) A change in which the physical properties of a substance alter without any change in its molecular composition or identity.
A physical change involves alterations in macroscopic physical attributes such as shape, size, density, state of matter, or appearance without altering the underlying chemical composition. The intrinsic molecular structure and chemical identity of the constituent particles remain completely unchanged, meaning no new chemical substances are formed and original properties can typically be restored using simple physical techniques.

**2.** (D) The intramolecular chemical bonds within the molecules
Melting represents a phase transformation where thermal energy overcomes the attractive forces holding particles in a rigid lattice. During this physical state change, only weak intermolecular forces between molecules are disrupted, altering spatial arrangements and particle mobility. The intramolecular covalent or ionic chemical bonds within individual molecules remain completely intact and unaltered throughout the process, maintaining chemical identity.

**3.** (A) A new chemical substance with entirely different chemical properties is formed.
Physical changes affect only physical parameters such as shape, size, state, and density without modifying the internal atomic configuration. The formation of a distinct chemical substance with new chemical properties is the hallmark of a chemical change rather than a physical change. Physical transformations preserve chemical identity, remain mass-conserved, and are generally reversible through simple physical adjustments.

**4.** (C) It changes because specific heat capacity is dependent on the physical state of the substance.
Specific heat capacity is an intrinsic physical property that depends heavily on the physical state and molecular arrangement of a substance. As matter transitions from a liquid to a gas, intermolecular forces weaken and molecular degrees of freedom change significantly. Consequently, the heat required to raise the temperature of one unit mass differs across liquid and gaseous phases.

**5.** (A) Physical changes involve breaking weak intermolecular forces, whereas chemical changes disrupt stronger intramolecular chemical bonds.
Thermodynamically, physical changes require relatively small energy inputs because they only involve overcoming weak non-covalent intermolecular interactions, such as van der Waals forces or hydrogen bonds. Conversely, chemical changes involve breaking and forming strong intramolecular ionic or covalent chemical bonds within molecules, which demands and releases significantly higher overall quantities of enthalpy during reaction progress.

**6.** (D) Reactants lose their original chemical identity to form one or more entirely new substances.
A chemical change involves the breaking of existing chemical bonds between atoms in reactant molecules and the formation of new bonds. This structural rearrangement alters the fundamental atomic connectivity, resulting in the production of completely new substances possessing distinct physical and chemical properties. Consequently, original reactants permanently forfeit their chemical identities during such transformations.

NODIA

**7.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Digestion is a complex metabolic process during which large insoluble macromolecules like proteins, fats, and carbohydrates undergo enzymatic hydrolysis. Specific enzymes break strong covalent bonds within these complex nutrients, transforming them into chemically distinct and simpler absorbable units like amino acids and glucose. Thus, digestion represents a true chemical change explained by bond breakdown.

**8.** (C) The transition of a substance from a solid to a liquid state upon heating
The transition of a solid into a liquid upon heating represents melting, which is purely a physical phase change. During melting, thermal energy weakens intermolecular attractions without breaking intramolecular chemical

bonds or forming new substances. Conversely, effervescence, permanent color shifts, and precipitate formation signify chemical changes driven by molecular rearrangements and chemical reactions.

**9.** (D) It is manifested as the absorption or release of heat, light, or electrical energy.
Although total mass remains conserved in a chemical reaction according to mass conservation laws, the chemical potential energy stored in chemical bonds changes during atom rearrangement. This energy difference between reactants and products manifests externally as absorbed or liberated enthalpy, light, or electricity, determining whether the reaction is endothermic or exothermic overall.

**10.** (A) Crystallization of copper sulphate from solution
Crystallization is a physical process where dissolved solute molecules organize into a highly ordered crystalline lattice upon cooling or evaporation without altering chemical identity. In contrast, souring of milk, atmospheric rusting of iron, and combustion of liquefied petroleum gas are all chemical changes involving chemical bond breaking, electron transfer, and new compound formation.

**11.** (C) Statement I is correct but Statement II is incorrect.
During a chemical reaction, atoms of reactant substances are neither created nor destroyed; instead, existing chemical bonds are broken and atoms rearrange into new molecular combinations. This structural reorganization leads to products with altered chemical properties while preserving individual atomic identities, fully satisfying the fundamental law of conservation of mass in classical chemistry.

**12.** (C) I and III only
Physical changes alter physical traits while leaving chemical composition intact, whereas chemical changes form new chemical identities. Energy changes during physical processes are typically small compared to those in chemical reactions. Chemical changes involve chemical bond reorganizations and cannot be reversed by simple physical methods, making statement II incorrect while statements I and III are accurate.

**13.** (A) The exact number and type of atoms
In any closed system undergoing a physical or chemical change, the fundamental law of conservation of mass dictates that matter is neither created nor destroyed. Consequently, the total number and specific identities of individual atoms remain strictly conserved throughout both physical phase transitions and complex chemical bond rearrangements within the system.

**14.** (C) Magnetization of an iron nail in a magnetic field – Chemical change
Magnetization of an iron nail involves aligning atomic magnetic domains within the metal under an external magnetic field without altering its chemical composition or atomic structure. Because no new chemical substance is created and the magnetic alignment is reversible, it is a physical change, rendering its classification as a chemical change incorrect.

**15.** (D) P-3, Q-4, R-2, S-1
Dissolving sugar creates a homogeneous mixture without chemical modification. Tarnishing silver is a surface chemical reaction forming silver sulphide. Melting wax is a physical phase change from solid to liquid. Burning wax involves chemical combustion of hydrocarbons forming carbon dioxide and water. Matching these processes yields the correct combination across all listed classifications.

**16.** (C) The thermal decomposition of calcium carbonate
Thermal decomposition of calcium carbonate requires breaking ionic and covalent bonds within the carbonate crystal structure to produce calcium oxide and carbon dioxide gas. This fundamental chemical transformation involves bond cleavage and new product formation, unlike boiling nitrogen, subliming iodine, or dissolving salt, which primarily alter intermolecular distances or ionic solute-solvent interactions.

**17.** (B) The emission of light by a tungsten filament in an incandescent bulb
When electric current flows through a tungsten filament, electrical energy converts to heat and light via incandescence without altering the chemical composition of tungsten. This process is purely physical and completely reversible upon turning off the current, unlike enzymatic browning, biogas generation, or cement setting, which all involve irreversible chemical reactions.

Click Here to Buy book on Flipkart

sulphide

**132.** Arrange the following steps in the correct sequence demonstrating the chemical mechanism of ozone layer depletion by chlorofluorocarbons (CFCs):
I. Chlorine atoms react with ozone ($O_3$) to form chlorine monoxide (ClO) and oxygen gas ($O_2$).
II. UV radiation breaks down CFC molecules in the stratosphere, releasing highly reactive chlorine atoms.
III. ClO reacts with a free oxygen atom, releasing the chlorine atom to destroy more ozone in a catalytic cycle.
IV. CFCs are released into the lower atmosphere from refrigerants and aerosols and slowly drift upward.
(A) IV, I, II, III
(B) IV, II, I, III
(C) II, IV, I, III
(D) I, III, II, IV

**133.** Photochemical smog is a serious environmental issue in sunny urban areas with heavy traffic. It is formed by complex photochemical reactions involving primary pollutants. Which of the following is a dangerous secondary pollutant formed during this process?
(A) Peroxyacetyl nitrate (PAN)
(B) Gaseous sulphur hexafluoride ($SH_6$)
(C) Asbestos fibers
(D) Fly ash

**134.** The greenhouse effect is a natural physical process essential for keeping the Earth warm. However, enhanced global warming is caused by increased atmospheric concentrations of certain gases due to human activity. Which of the following is the most significant anthropogenic greenhouse gas by total volume?
(A) Methane ($CH_4$)
(B) Nitrous oxide gas ($N_2O$)
(C) Water vapour ($H_2O$)
(D) Carbon dioxide ($CO_2$)

**135.** The excessive use of nitrogenous and phosphatic chemical fertilizers in agriculture leads to nutrient runoff into nearby water bodies. This triggers a rapid overgrowth of algae, which eventually depletes dissolved oxygen in the water. What is this detrimental ecological process called?
(A) Biomagnification
(B) Eutrophication
(C) Salinization
(D) Bioremediation

**136.** In a standard laboratory experiment, a student bubbles a colorless, odorless gas through clear lime water (calcium hydroxide solution), and the lime water turns milky. What specific chemical change causes this milkiness?
(A) The physical dissolving of carbon dioxide to form carbonic acid.
(B) The formation of soluble calcium bicarbonate.
(C) The formation of an insoluble precipitate of calcium carbonate.
(D) The rapid evaporation of water leaving behind calcium oxide powder.

**137.** Consider the following statements regarding laboratory litmus tests for identifying the nature of chemical solutions:
I. Blue litmus paper turns red when dipped in an acidic solution.
II. Red litmus paper remains red in a neutral solution.
III. Blue litmus paper turns white (bleached) when exposed to moist chlorine gas.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**138.** A student drops a piece of zinc metal into a test tube containing dilute sulphuric acid. A gas is evolved rapidly. To confirm the identity of this gas, the student brings a burning matchstick near the mouth of the test tube. The gas burns with a characteristic "pop" sound. Which gas is it?
(A) Hydrogen
(B) Oxygen
(C) Nitrogen
(D) Carbon dioxide

**139.** Consider the following statements about common laboratory gas identification tests:
I. Oxygen gas rekindles a glowing splint.
II. Carbon dioxide extinguishes a burning splint.
III. Ammonia gas turns moist red litmus paper blue.
IV. Hydrogen sulphide gas has a characteristic smell of rotten eggs.
Which of the above statement(s) is/are correct?
(A) I, II, and III only

NODIA

into simpler compounds, releasing heat energy into the surroundings, making it an exothermic chemical change. Photosynthesis is endothermic, cellular respiration is exothermic, and dissolving glucose in water is a physical dissolution process, validating the correct pairing of decomposition as exothermic.

**28.** (A) I and II only
Blackening of silver involves a chemical reaction with atmospheric hydrogen sulphide to form silver sulphide. Browning of cut potatoes is an enzymatic chemical oxidation forming melanins. Conversely, melting gold is purely a physical phase change from solid to liquid without forming any new chemical substance, making processes I and II chemical changes.

**29.** (A) II, IV, I, III
To demonstrate a single displacement reaction, an aqueous copper sulphate solution is prepared first in a beaker. Cleaned iron nails are then immersed into this solution. As iron displaces copper ions, the blue solution gradually turns pale green due to ferrous sulphate formation, and reddish-brown copper metal deposits onto the immersed iron nails.

**30.** (C) A combination reaction
When magnesium ribbon burns in the presence of atmospheric oxygen, two distinct elemental reactants—magnesium metal and oxygen gas—combine chemically to form a single unified compound, magnesium oxide. Chemical reactions in which two or more simple reactants combine to synthesize a single product are classified fundamentally as combination or synthesis reactions.

**31.** (D) Nitrogen dioxide ($NO_2$)
Thermal decomposition of lead nitrate produces solid lead oxide, gaseous oxygen, and nitrogen dioxide gas. Nitrogen dioxide is characterized by its distinctive reddish-brown fumes released during heating. The balanced reaction demonstrates that nitrate ions break down under high heat, releasing nitrogen dioxide as the prominent gaseous product responsible for visible coloration.

**32.** (C) Hydrogen; it burns with a characteristic 'pop' sound.
Zinc reacts with dilute hydrochloric acid in a single displacement reaction, yielding aqueous zinc chloride and evolving hydrogen gas. Hydrogen is a colorless, odorless gas that is highly flammable. When exposed to a lighted splint near the test tube opening, hydrogen gas combusts rapidly with oxygen, producing a distinct acoustic 'pop' sound.

NODIA

**33.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
In a single displacement reaction, a metal can displace another metal from its salt solution only if it possesses higher reactivity. Copper is positioned below zinc in the electrochemical reactivity series, meaning copper has a lower oxidation potential. Consequently, copper cannot reduce zinc ions, making both statements true with the reason explaining the assertion.

**34.** (D) Black and white photography
Silver halides such as silver chloride and silver bromide undergo photolytic decomposition when exposed to light, breaking down into elemental silver metal and halogen gas. The metallic silver produced creates a dark image pattern. This light-sensitive chemical behavior formed the foundational basis for traditional black and white photographic film and paper processing.

**35.** (A) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
A double displacement reaction involves the mutual exchange of cations and anions between two reacting ionic compounds in aqueous solution. In the reaction between sodium sulphate and barium chloride, sodium and barium exchange anion partners, forming an insoluble barium sulphate precipitate alongside soluble sodium chloride, perfectly fitting double displacement mechanics.

**36.** (C) A reaction where mixing aqueous solutions forms an insoluble solid product.
A precipitation reaction occurs when two soluble ionic compounds in aqueous solution react to form an insoluble ionic solid, known as a precipitate. The insoluble product separates from the liquid phase due to low solubility product limits, providing a clear visual indicator of ionic double displacement occurring in the solution.

**37.** (A) Yellow; Lead (II) iodide
When clear aqueous solutions of potassium iodide and lead nitrate are combined, a double displacement reaction occurs. Lead ions react with iodide ions to form lead iodide, an insoluble

**18.** (C) I and III only
Evaporation involves overcoming intermolecular hydrogen bonds, making statement I correct. Mechanical cutting of wood alters physical dimensions irreversibly without forming new chemical substances, making statement III correct. Shattering glass does not alter chemical composition, making II false. Dissolving carbon dioxide forms carbonic acid chemically, making IV false. Thus, only I and III hold true.

**19.** (A) The original salt can be recovered chemically unaltered by evaporating the water.
Dissolving sodium chloride in water dissociates the ionic lattice into hydrated sodium and chloride ions without changing their fundamental chemical identities. Because water can be evaporated away to yield identical solid salt crystals back, no new chemical substance is formed, defining the process primarily as a fully reversible physical dissolution process.

**20.** (C) Sublimation, which is a reversible physical change.
When solid ammonium chloride is heated, it undergoes phase transition directly into gas, which then redeposits as a solid upon contact with cooler glass surfaces. This direct solid-to-gas transition without entering an intermediate liquid state is called sublimation, representing a reversible physical change because the substance retains its original identity upon condensation.

**21.** (A) Condensation of water vapour on a cold glass surface
Condensation is an exothermic phase transition where gaseous molecules release latent heat of vaporization to their surroundings as they transition into a lower-energy liquid state. Conversely, melting, evaporation, and sublimation are endothermic physical processes that absorb thermal energy from the environment to overcome intermolecular attractive forces holding molecules together.

**22.** (D) Complete annealing of glass to modify its internal structure
Stretching rubber, expanding steel railway tracks, and hammering malleable metals represent straightforward physical modifications affecting mechanical state or spatial arrangement without significant microstructural stress relaxation. Annealing glass involves controlled heating and slow cooling to relieve internal thermal stresses and alter microscopic network structure, setting it apart as a controlled heat-treatment process.

**23.** (A) Solid wax melts → Liquid wax vaporizes → Vapours combust chemically → Heat and light are produced
When a candle burns, thermal heat from the lit wick first melts solid wax into liquid wax via physical phase change. Capillary action draws liquid wax up the wick where it vaporizes into gas. Finally, gaseous hydrocarbon vapor reacts chemically with atmospheric oxygen in a combustion reaction, producing light, heat, water, and carbon dioxide.

**24.** (C) Bacterial action converts lactose sugar into lactic acid, changing its chemical composition.
Souring of milk is a chemical process caused by lactic acid bacteria fermenting lactose sugar into lactic acid. The accumulation of lactic acid increases acidity, causing milk proteins like casein to denature and coagulate into curd. Because new chemical compounds with altered chemical properties are formed, the process represents an irreversible chemical change.

**25.** (D) Reversible chemical change in a rechargeable lithium-ion battery
Rechargeable lithium-ion batteries operate via reversible electrochemical redox reactions. During discharge, chemical reactions convert stored chemical potential into electrical energy. Applying an external electric voltage forces lithium ions and electrons to move in reverse, restoring the original chemical reactants. This demonstrates that certain chemical reactions can be reversed through applied electrical energy.

**26.** (C) Statement I is correct but Statement II is incorrect.
Fruit ripening is an irreversible biochemical process regulated by ethylene that triggers enzymatic breakdown of starch into sugars, altering chemical composition. Softening upon boiling results from thermal degradation and structural weakening of cell wall pectin molecules, which is a physical and macromolecular breakdown rather than a total breakdown of fundamental atomic structures.

**27.** (B) Biological decomposition of organic decay matter – Exothermic chemical change
Biological decomposition of organic matter by microorganisms breaks down complex molecules

Downloaded from www.pdf.tube

numerical value, reflecting net thermal energy uptake by the chemical system.

**48.** (C) Endothermic, because the system absorbs thermal energy from its surroundings.
When solid ammonium nitrate dissolves in water, breaking its ionic crystal lattice absorbs more thermal energy than is released during ion hydration. The dissolving process extracts kinetic heat energy from the aqueous solution and surrounding glass container, dropping the system temperature and producing a cold feeling characteristic of an endothermic process.

**49.** (B) Both require activation energy; in exothermic reactions, energy released forming products exceeds activation energy input.
All chemical reactions require an initial input of activation energy to reach the transition state and initiate bond breaking. In exothermic reactions, the energy released when new bonds form in the products is greater than the activation energy absorbed, yielding a net release of energy despite requiring activation energy to start.

**50.** (A) Energy of reactants → Energy absorbed to reach transition state → Energy released forming products → Energy of products (lower than reactants)
In an exothermic potential energy profile, reactants begin at a baseline energy level, absorb activation energy to overcome the energy barrier to reach the transition state, and release energy as chemical bonds form. The final energy level of the products rests lower than the initial energy of reactants, yielding negative enthalpy change.

**51.** (A) Because it involves the breakdown of complex molecules, which inherently releases energy.
Cellular respiration breaks down glucose molecules in the presence of oxygen to yield carbon dioxide, water, and ATP energy. Because the cumulative chemical bond energy released during product formation exceeds the energy consumed to break reactant bonds, net energy is liberated into the cellular system, defining respiration as an exothermic biochemical process.

**52.** (C) It provides an alternative reaction pathway with a lower activation energy.
A positive catalyst accelerates chemical reactions by introducing an alternative reaction mechanism that possesses a lower activation energy barrier than the uncatalyzed path. Consequently, a greater fraction of molecular collisions attain sufficient energy to cross the activation barrier, increasing overall reaction speed without changing chemical equilibrium or being permanently consumed.

**53.** (A) It increases the rates of forward and backward reactions equally, preserving equilibrium.
In a reversible system at equilibrium, adding a catalyst lowers the activation energy for both forward and reverse reaction pathways by exactly the same amount. As a result, the rates of forward and reverse reactions increase equally, allowing the system to reach equilibrium faster without altering the equilibrium position or concentrations.

NODIA

**54.** (D) Enzymes are substrate-specific and operate best within narrow pH and temperature ranges.
Enzymes are specialized biological protein catalysts that display high substrate specificity due to unique active site geometry. Unlike inorganic catalysts that withstand extreme environments, enzymes operate optimally only within strict physiological temperature and pH ranges. Thermal or chemical deviations cause enzyme denaturation, destroying catalytic activity by altering tertiary protein structures.

**55.** (B) Inhibitors or catalytic poisons
Substances that diminish or eliminate the catalytic activity of a catalyst are termed catalytic poisons or inhibitors. These chemical agents adsorb strongly onto active sites on the catalyst surface or alter its structure, preventing reactant molecules from binding and thereby reducing or stopping the rate of the catalyzed chemical reaction.

**56.** (C) The adsorption of reactant molecules onto the surface of the catalyst.
Heterogeneous catalysis involves reactants and catalysts existing in different physical states. A critical phase in the catalytic mechanism is the adsorption of gaseous or liquid reactant molecules onto the solid catalyst surface. Adsorption weakens chemical bonds within reactant molecules, facilitating reaction progress before product molecules desorb from active surface sites.

**57.** (D) Law of Conservation of Mass
Balancing chemical equations requires ensuring that the total number of atoms of

aquatic ecosystems. Nutrient enrichment triggers rapid algal blooms that cover water surfaces. When dense algae die, aerobic decomposers consume vast amounts of dissolved oxygen during decay, creating hypoxic dead zones that threaten aquatic organisms and collapse local marine life.

**136.** (C) The formation of an insoluble precipitate of calcium carbonate.
Bubbling carbon dioxide gas through clear lime water, which is an aqueous calcium hydroxide solution, triggers a precipitation reaction. Carbon dioxide reacts chemically with dissolved calcium hydroxide to form calcium carbonate, an insoluble white compound. Suspended solid calcium carbonate particles scatter light, imparting a milky white appearance to the liquid mixture.

**137.** (D) I, II, and III
Litmus is a natural pH indicator. Blue litmus paper turns red in acidic solutions due to high hydrogen ion concentrations (I). Red litmus paper remains red in neutral solutions where pH equals seven (II). Moist chlorine gas acts as a strong chemical oxidizing agent that permanently bleaches blue litmus white (III). Thus, all three statements are correct.

**138.** (A) Hydrogen
When zinc metal reacts with dilute sulphuric acid, a single displacement reaction occurs, yielding zinc sulphate solution and liberating hydrogen gas. Hydrogen is a flammable gas with low density. Bringing a burning matchstick near the test tube ignites the collected hydrogen gas, causing a rapid combustion reaction with oxygen that yields a characteristic acoustic 'pop'.

**139.** (D) I, II, III, and IV
Oxygen supports combustion and rekindles glowing splints (I). Carbon dioxide displaces oxygen and extinguishes flames (II). Basic gaseous ammonia turns moist red litmus paper blue via hydroxide formation (III). Hydrogen sulphide gas emits a distinctive rotten egg odor due to sulphide compounds (IV). Thus, all four laboratory gas tests are described accurately.

**140.** (B) Barium
In flame photometry, qualitative identification relies on characteristic atomic emission spectra produced when metal ions absorb thermal energy in a Bunsen flame. Excited electrons release photons of characteristic wavelengths upon returning to ground states. Barium cations emit light at specific green wavelengths, imparting a distinctive apple-green color to the flame during analysis.

www.nodia.in

Click Here to Buy book on Amazon

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

**67.** (A) 4.4 grams
According to the Law of Conservation of Mass, the total mass of reactants must equal the total mass of products in a chemical reaction. For the thermal decomposition of ten grams of calcium carbonate yielding 5.6 grams of calcium oxide, subtracting 5.6 grams from ten grams yields exactly 4.4 grams of carbon dioxide gas.

**68.** (A) IV, II, I, III
When heating ice from -10°C to 110°C, solid ice first absorbs sensible heat until reaching 0°C. At 0°C, ice absorbs latent heat of fusion and melts into liquid water. Liquid water then absorbs sensible heat, raising its temperature to 100°C. Finally, water absorbs latent heat of vaporization at 100°C to form steam.

**69.** (A) Latent heat of fusion
The heat energy absorbed by a substance at its melting point without increasing its temperature is known as the latent heat of fusion. This absorbed energy is utilized exclusively to overcome attractive intermolecular forces holding particles in the solid crystal lattice, converting the solid into a liquid state while kinetic energy remains constant.

**70.** (B) II, III, and IV only
During phase transitions at constant boiling temperature, kinetic energy stays constant while latent heat breaks intermolecular bonds, making statement I false. Supplied heat breaks lattice bonds during melting (II). Evaporation occurs from surface layers below boiling point (III). Freezing releases kinetic energy, decreasing particle speed (IV). Thus, statements II, III, and IV are correct.

**71.** (B) Evaporation occurs below boiling point at the surface, whereas boiling occurs at a fixed temperature throughout the bulk.
Evaporation is a surface phenomenon occurring spontaneously at any temperature below the boiling point, where energetic surface molecules escape liquid bounds. In contrast, boiling is a bulk phenomenon occurring at a specific boiling temperature where saturated vapor pressure equals external atmospheric pressure, forming vapor bubbles throughout the entire bulk liquid volume.

**72.** (C) Triple point
In thermal physics, the triple point defines the unique state of temperature and pressure at which solid, liquid, and gaseous phases of a pure substance coexist simultaneously in stable thermodynamic equilibrium. At this precise point, phase boundaries intersect, and dynamic interconversion between all three states occurs without disturbing thermodynamic equilibrium.

**73.** (D) Naphthalene
Naphthalene is an nonpolar organic compound that readily undergoes sublimation at standard atmospheric pressure when heated. Because its solid lattice is held together by weak van der Waals intermolecular forces, solid naphthalene transitions directly into vapor without melting into an intermediate liquid phase, demonstrating classic sublimation behavior upon gentle heating.

NODIA

**74.** (A) Law of Definite Proportions
The Law of Definite Proportions states that a given pure chemical compound always contains its constituent elements combined together in fixed and definite mass proportions, regardless of its source or synthetic method. This fixed chemical composition fundamentally distinguishes chemical compounds from variable mixtures, maintaining consistent elemental stoichiometry across all valid sample preparations.

**75.** (B) A mixture retains the properties of its constituents, whereas a compound exhibits distinct new chemical properties.
A mixture consists of physically combined substances that retain their individual physical and chemical identities without forming new chemical bonds. Conversely, a chemical compound forms through chemical bonding between elements, producing a distinct substance whose physical and chemical properties differ entirely from those of its individual constituent chemical elements.

**76.** (B) Passing a magnet over both; it will attract iron from the mixture but not from the compound.
In an unheated mixture of iron filings and sulphur, iron retains its ferromagnetic property, allowing a magnet to easily attract and separate iron particles. When heated, iron and sulphur react chemically to form iron sulphide, a chemical compound where iron loses its magnetic

character, leaving it uninfluenced by external magnets.

**77.** (A) P-4, Q-3, R-2, S-1
Sugar dissolved in water forms a homogeneous solid-in-liquid aqueous solution. Milk is a liquid-in-liquid colloidal emulsion of fat globules dispersed in liquid. Carbonated water contains dissolved carbon dioxide gas in liquid. Smoke represents solid particulate matter suspended in air, forming an aerosol. Matching these pairs aligns with the specified number sequence.

**78.** (C) As homogeneous mixtures (solid solutions)
Standard alloys such as brass and bronze are classified chemically as homogeneous mixtures, specifically solid solutions. In these materials, atoms of two or more metals or elements are uniformly distributed throughout a single crystal lattice without forming fixed stoichiometric chemical bonds, preserving variable composition while displaying uniform metallic properties throughout.

**79.** (D) Azeotropic mixtures
Azeotropic mixtures are liquid solutions of two or more compounds that exhibit constant boiling behavior because vapor generated during boiling maintains identical composition to the liquid mixture. Because vapor and liquid compositions remain unchanged during distillation, azeotropes cannot be separated into pure individual components using standard fractional distillation techniques.

**80.** (C) Potassium (K)
Potassium is positioned near the top of the electrochemical reactivity series, possessing a very low ionization energy. It reacts violently with oxygen gas and atmospheric moisture at room temperature to form hydroxides and hydrogen. To prevent spontaneous combustion and explosive reactions, potassium is safely stored immersed under mineral oil.

**81.** (B) The metal is placed above hydrogen in the reactivity series.
According to single displacement reaction principles and standard reduction potentials, a metal can displace hydrogen gas from dilute acid solutions only if it resides above hydrogen in the reactivity series. Metals above hydrogen possess greater oxidation tendencies, allowing them to donate electrons to hydrogen ions and liberate hydrogen gas.

**82.** (D) White phosphorus
White phosphorus is an extremely reactive non-metal with a very low ignition temperature. When exposed to ambient atmospheric air at room temperature, white phosphorus reacts spontaneously with oxygen, undergoing combustion and producing dense fumes of phosphorus pentoxide. To prevent contact with atmospheric oxygen, it is stored submerged under water.

**83.** (A) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
When alkali metals like sodium react with cold liquid water, sodium atoms undergo vigorous oxidation, displacing hydrogen ions from water molecules. This highly exothermic redox reaction produces soluble sodium hydroxide, creating a strongly basic aqueous solution, and evolves flammable hydrogen gas, properly balanced as two sodium atoms reacting with two water molecules.

**84.** (C) Acidic
Most non-metal oxides form acidic solutions when dissolved in water because they act as acid anhydrides. When non-metallic oxides such as carbon dioxide or sulphur dioxide dissolve in aqueous media, they react chemically with water molecules to yield acidic compounds like carbonic acid or sulphurous acid, lowering overall solution pH.

**85.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Atmospheric rusting of iron is an electrochemical oxidation process that requires the concurrent presence of both oxygen gas and moisture. Humid coastal air contains high concentrations of water vapor alongside dissolved salt electrolytes, accelerating the corrosion rate significantly compared to dry desert environments. Thus, both statements are true and correctly linked.

**86.** (D) $Fe_2O_3.xH_2O$
Rusting produces a reddish-brown, brittle, and porous flaky layer consisting chemically of hydrated iron (III) oxide. Formed through complex multi-step oxidation and hydration reactions involving metallic iron, oxygen, and water, rust is represented by the formula $Fe_2O_3.xH_2O$, where x denotes variable stoichiometric

Downloaded from www.pdf.tube

amounts of associated crystallization water molecules.

**87.** (B) Galvanization
Galvanization is an industrial corrosion-prevention technique involving the application of a protective surface coating of molten zinc over steel or iron objects. Because zinc is more reactive than iron, it acts as a barrier and oxidizes preferentially, protecting underlying iron structures from corrosion even if the zinc layer is scratched.

**88.** (C) Cathodic protection (sacrificial protection)
Attaching more electrochemically active metals like zinc or magnesium to steel structures provides sacrificial cathodic protection. The sacrificial metal acts as an anode and oxidizes preferentially, supplying electrons to the iron structure, which acts as a cathode. This process prevents iron from losing electrons, thereby protecting subsea structures from corrosion.

**89.** (A) I and II only
Copper corrodes in moist air forming a green surface coating of basic copper carbonate, validating I. Silver tarnishes to black silver sulphide due to airborne hydrogen sulphide, validating II. Aluminum forms a protective, non-porous oxide film that halts further corrosion, unlike iron, making III incorrect and validating statements I and II.

**90.** (A) An electrochemical cell process involving oxidation at the anode and reduction at the cathode.
Rusting operates fundamentally as a microscopic electrochemical cell. Impurities or surface strain on iron function as anodic sites where iron oxidizes into ferrous ions. Surrounding moisture containing dissolved oxygen serves as cathodic sites where oxygen is reduced to hydroxide ions. Electrolytic movement of ions through water forms hydrated iron oxide.

**91.** (B) Carbon monoxide (CO)
Incomplete combustion occurs when hydrocarbon fuels burn in a limited or insufficient oxygen supply. Unburnt carbon atoms undergo partial oxidation to produce carbon monoxide gas alongside water vapor. Carbon monoxide is a highly toxic, colorless, and odorless gas that binds strongly with hemoglobin in blood, hindering cellular oxygen transport.

**92.** (B) Calorific value
Calorific value quantifies fuel efficiency by measuring the total heat energy released during complete combustion of a unit mass (typically one kilogram) of fuel in oxygen. Usually expressed in kilojoules per kilogram, higher calorific values denote more efficient energy sources capable of yielding greater thermal output per unit mass burned.

**93.** (A) Ignition temperature
Ignition temperature represents the minimum temperature to which a combustible substance must be heated in air for it to catch fire and sustain combustion. Below this critical thermal threshold, reactant molecules lack sufficient thermal kinetic energy to overcome activation energy barriers required to initiate rapid oxidative combustion reactions.

NODIA

**94.** (C) Complete combustion due to an adequate supply of oxygen.
Opening the air hole on a Bunsen burner allows sufficient oxygen to mix thoroughly with fuel gas before ignition. This abundant oxygen supply ensures complete combustion of hydrocarbon molecules into carbon dioxide and water. The resulting non-luminous blue flame produces high temperatures without generating glowing, unburnt soot particles.

**95.** (D) I, II, III, and IV
Oil floats on water, continuing combustion (I). Carbon dioxide is non-conductive, suited for electrical fires (II). Heated sodium bicarbonate in dry powder extinguishers decomposes releasing carbon dioxide (III). Strong oxidizing agents like chlorine support combustion without oxygen gas (IV). Consequently, all four statements accurately describe combustion and fire safety principles.

**96.** (C) Spontaneous combustion
Spontaneous combustion occurs when a substance with a low ignition temperature oxidizes rapidly at room temperature without external heating. Heat generated by slow internal oxidation accumulates within the material until it reaches its ignition threshold, causing the substance to suddenly ignite and burst into flames, as observed with white phosphorus.

**97.** (B) Anaerobic conditions (absence of oxygen)
Fermentation is a metabolic pathway performed by microorganisms like yeast to extract metabolic energy from simple sugars in the absence of molecular oxygen. Under strictly anaerobic conditions, yeast converts simple carbohydrates into ethanol and carbon dioxide, whereas aerobic conditions redirect metabolism away from ethanol production toward aerobic respiration.

**98.** (D) Zymase
Zymase is a complex multi-enzyme system naturally secreted by yeast cells such as Saccharomyces cerevisiae. It catalyzes the anaerobic biochemical degradation of simple hexose sugars like glucose and fructose, breaking them down into ethanol and carbon dioxide gas during the biological process of alcoholic fermentation under mild environmental conditions.

**99.** (B) Malting (starch to maltose) → Mashing → Fermentation by yeast → Distillation of ethanol
Producing ethanol from starchy grain requires malting to generate amylase enzymes converting complex starch into maltose sugar. Mashing dissolves these fermentable sugars into water. Yeast addition initiates fermentation, converting sugars into dilute alcohol solutions. Finally, fractional distillation separates ethanol from the liquid mixture based on boiling point differences.

**100.** (C) Carbon dioxide
During yeast fermentation of sugars in fruit juices, glucose undergoes metabolic breakdown to produce ethanol and carbon dioxide gas. Continuous evolution of carbon dioxide generates visible gas bubbles within the fermenting liquid. Capturing or releasing carbon dioxide determines whether sparkling or still wine variants are produced during beverage manufacturing.

**101.** (A) Lactic acid
Lactic acid fermentation is an anaerobic pathway utilized by lactic acid bacteria and oxygen-deprived mammalian muscle cells. During strenuous physical exercise, muscle tissues generate ATP anaerobically by reducing pyruvate directly into lactic acid. Accumulated lactic acid induces muscle fatigue and soreness until oxygen levels normalize to clear metabolic waste.

**102.** (D) P-2, Q-4, R-1, S-3
Yeast ferments sugars into ethanol. Lactobacillus bacteria convert milk lactose into lactic acid, forming curd. Acetobacter bacteria oxidize alcohol into acetic acid, yielding vinegar. Methanogenic bacteria anaerobically decompose organic matter into methane gas, producing biogas. Matching these specific biological agents with their corresponding outputs validates the matching sequence P-2, Q-4, R-1, S-3.

**103.** (B) The movement of mobile positive and negative ions
Electrical conduction through electrolytic solutions or molten ionic compounds occurs via electrolytic conduction rather than free electron flow. When potential difference is applied across submerged electrodes, positively charged cations migrate toward the negative cathode, while negatively charged anions travel toward the positive anode, carrying electric charge through mobile ionic transport.

**104.** (C) The total quantity of electricity (charge) passed through the electrolyte.
Faraday's First Law of Electrolysis states that the chemical mass liberated or deposited at an electrode during electrolysis is directly proportional to the total electric charge passing through the electrolyte. Charge equals current multiplied by time, establishing that chemical yield increases linearly with the total quantity of electricity supplied.

**105.** (D) 2:1
Water electrolysis breaks down liquid $H_2O$ into constituent hydrogen and oxygen gases according to stoichiometry. Reduction at the cathode generates two moles of hydrogen gas for every mole of oxygen gas produced by oxidation at the anode. Consequently, collected gas volumes maintain a strict two-to-one volumetric ratio of hydrogen to oxygen.

**106.** (A) The iron spoon is made the cathode and a pure silver rod is made the anode.
Electroplating requires connecting the target object to be coated as the cathode and the pure plating metal as the anode within an electrolyte bath containing target metal ions. Dissolving silver anode oxidizes into silver ions, which migrate toward the negative iron spoon cathode, gaining electrons to deposit a uniform metallic silver coating.

Click Here to Buy book on Flipkart

**107.** (B) Reduction occurs at the cathode, and oxidation occurs at the anode.
In all electrochemical and electrolytic cells, electrode reactions follow universal rules based on electron flow direction. Oxidation, defined as electron loss, takes place at the positive anode where negative anions discharge. Reduction, defined as electron gain, takes place at the negative cathode where positive cations acquire electrons to form neutral elements.

**108.** (B) Hydrogen
Electrolyzing aqueous sodium chloride (brine) involves competing reduction reactions at the cathode between sodium ions and water molecules. Because hydrogen ions from water reduction have a higher reduction potential than sodium ions, hydrogen gas is preferentially evolved at the cathode, leaving sodium hydroxide in solution while chlorine gas evolves at the anode.

**109.** (A) The rate of the forward reaction equals the rate of the backward reaction.
Dynamic chemical equilibrium occurs in reversible systems within closed vessels when forward and reverse reaction rates become perfectly equal. Although molecular transformations continue in both directions at microscopic scales, macroscopic concentration ratios of reactants and products remain entirely constant over time, defining dynamic equilibrium without chemical reactions stopping entirely.

**110.** (C) Le Chatelier's Principle
Le Chatelier's Principle states that when a chemical system at dynamic equilibrium experiences a change in temperature, pressure, or reactant concentration, the equilibrium position shifts in the direction that counteracts the applied disturbance. This fundamental thermodynamic rule enables chemists to optimize chemical synthesis yields by systematically adjusting industrial environmental conditions.

**111.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Ice melting into liquid water is a classic reversible physical change because phase transition alters physical state without changing chemical formula. Liquid water can be converted back into solid ice simply by lowering temperature below 0°C, restoring original structural properties. Thus, both assertion and reason are true, with the reason correctly explaining reversibility.

**112.** (C) Formed ashes and gaseous products cannot spontaneously recombine to reform complex wood polymers.
Combustion of wood is an irreversible chemical change where complex biopolymers react with oxygen to yield ash, carbon dioxide, and water vapor. These oxidized combustion products possess far lower potential energy and altered chemical structures, preventing them from spontaneously recombining under standard physical conditions to reform complex cellulose and lignin molecules.

**113.** (B) When it is carried out in a closed vessel where $CO_2$ cannot escape.
Thermal decomposition of calcium carbonate yields solid calcium oxide and gaseous carbon dioxide. In an open container, carbon dioxide gas escapes, driving the reaction to completion irreversibly. In a closed vessel, accumulating carbon dioxide gas cannot escape, establishing a dynamic chemical equilibrium where calcium oxide continuously recombines with carbon dioxide to reform calcium carbonate.

**114.** (D) Irreversible processes
According to the Second Law of Thermodynamics, spontaneous processes in closed systems proceed with an overall increase in total universe entropy. Natural chemical processes such as rusting or wood combustion release energy into the surroundings and increase molecular disorder, making them thermodynamic irreversible processes that cannot naturally reverse without external energy input.

**115.** (A) I and II only
Chemical reactions involve breaking reactant bonds, which requires energy input (endothermic phase, statement I), and forming product bonds, which releases energy (exothermic phase, statement II). If bond-formation energy exceeds bond-breaking energy, net energy is released, defining an exothermic reaction. Statement III incorrectly describes endothermic reactions, making statements I and II correct.

**116.** (C) Photochemical reactions
Photochemical reactions are chemical transformations initiated or driven by the absorption of light energy, usually in the visible

Downloaded from www.pdf.tube

each participating element is identical on both reactant and product sides. This procedure satisfies the Law of Conservation of Mass, which asserts that matter cannot be created or destroyed in chemical reactions, requiring total mass to remain constant throughout.

**58.** (A) 3, 4, 1, 4
Balancing the chemical reaction requires equating iron, hydrogen, and oxygen atoms across both sides. Three iron atoms balance the three iron atoms in magnetite. Four water molecules provide the four oxygen atoms present in magnetite while yielding eight hydrogen atoms, which are balanced by four diatomic hydrogen molecules, giving integer coefficients 3, 4, 1, 4.

**59.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Chemical reactions involve interactions between whole, indivisible atoms that cannot be split into fractional parts during ordinary chemical transformations. To accurately reflect atom conservation and molecular reality, chemical equations are conventionally written using whole-number stoichiometric coefficients, making both the assertion and reason true with the reason explaining the assertion.

**60.** (B) Oxygen, because it appears in multiple products and as a diatomic molecule in the reactants.
When balancing combustion equations for hydrocarbons, carbon and hydrogen atoms are balanced first because they originate from a single reactant compound. Oxygen is balanced last because oxygen atoms appear across multiple product compounds and elemental oxygen exists as a diatomic gas, allowing straightforward final coefficient adjustment without disturbing previously balanced elements.

**61.** (A) It does not reveal physical states of substances unless explicitly annotated.
A standard balanced chemical equation provides stoichiometric mole ratios and identifies chemical formulas, but inherently lacks information regarding experimental conditions, reaction rates, mechanisms, or physical states unless state symbols are explicitly appended. Thus, the absence of automatic physical state information represents a recognized structural limitation of unannotated standard chemical equations.

**62.** (C) Antoine Lavoisier
French chemist Antoine Lavoisier formulated the Law of Conservation of Mass in the late eighteenth century through rigorous quantitative measurements of combustion reactions. By demonstrating that mass remains conserved in closed systems during chemical transformations, Lavoisier fundamentally revolutionized chemical science, earning widespread recognition as the "Father of Modern Chemistry."

**63.** (D) The reaction must occur within a completely closed and sealed system.
To experimentally demonstrate mass conservation during gas-evolving reactions, the apparatus must be entirely closed and sealed. If the system remains open, gaseous products escape into the atmosphere, causing an apparent loss of mass. A sealed container captures generated gases, ensuring that total measured mass before and after reaction remains constant.

**64.** (A) I and II only
The Law of Conservation of Mass dictates that reactant mass consumed equals product mass generated in standard chemical reactions. It holds for chemical changes, though nuclear reactions convert mass to energy via mass-energy equivalence. Statement III is incorrect because molecular numbers can change during reactions, validating that statements I and II are correct.

**65.** (B) It is converted into energy according to Einstein's equation $E = mc^2$.
In nuclear reactions, binding energy changes release immense heat, causing a measurable reduction in rest mass known as the mass defect. According to Albert Einstein's mass-energy equivalence equation, $E = mc^2$, this missing mass is directly converted into equivalent nuclear energy rather than being permanently destroyed or escaping as matter.

**66.** (D) The Law of Conservation of Mass
Landolt utilized a sealed H-shaped glass tube to study chemical precipitation reactions between liquid solutions placed in separate arms. By weighing the sealed system before and after mixing and reacting the contents, Landolt proved that total mass remains completely unchanged, providing conclusive experimental verification for the Law of Conservation of Mass.

NODIA

**126.** (C) P-3, Q-1, R-2, S-4
Fractional distillation separates liquid air into nitrogen and oxygen based on boiling points. Centrifugation separates light cream from dense liquid milk. Chromatography separates distinct pigments in ink through phase partition. Sublimation separates sublimable camphor from non-volatile salt crystals. Matching these separation principles with their corresponding mixtures produces the matching sequence P-3, Q-1, R-2, S-4.

**127.** (D) Differential partitioning between a stationary and a mobile phase.
Chromatography operates by passing a fluid mobile phase containing a chemical mixture over an immobile stationary phase. Individual components partition differentially between stationary and mobile phases based on variations in solubility, polarity, or adsorption affinity. Consequently, components travel at different speeds across the medium, achieving clean physical separation along the chromatographic pathway.

**128.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Simple distillation effectively separates miscible liquids provided their boiling points differ by at least 25°C without thermally decomposing components. Acetone boils at 56°C and water at 100°C, presenting a boiling point difference of 44°C. Lower-boiling acetone vaporizes first, condenses, and separates cleanly, making both assertion and reason true with correct logical explanation.

**129.** (B) Centrifugation
Centrifugation uses rapid rotational force to accelerate sedimentation of suspended particles in liquid mixtures. When blood is spun in a centrifuge, dense cellular components like red blood cells experience stronger outward centrifugal forces and settle rapidly at the bottom, while lighter liquid blood plasma remains floating above, achieving rapid physical phase separation.

**130.** (D) Iron
Magnetic separation techniques utilize differences in magnetic susceptibility to separate ferromagnetic substances from non-magnetic materials. In municipal solid waste facilities, overhead electromagnets exert attractive magnetic forces specifically on ferromagnetic metals like iron and steel, pulling them away from non-magnetic waste streams on moving conveyor belts to facilitate automated industrial recycling.

**131.** (A) Sulphur dioxide and Nitrogen dioxide
Combustion of fossil fuels in industrial plants and vehicles releases gaseous pollutants, primarily sulphur dioxide and nitrogen dioxide. Once released into the atmosphere, these oxides undergo photochemical oxidation and react with cloud moisture, forming corrosive sulphuric acid and nitric acid solutions that precipitate as acidic rain, damaging ecosystems and infrastructure.

**132.** (B) IV, II, I, III
CFCs released into the lower atmosphere gradually migrate upward into the stratosphere (IV). Solar ultraviolet radiation dissociates CFC molecules, releasing free chlorine radicals (II). Reactive chlorine radicals attack ozone molecules to yield chlorine monoxide and oxygen gas (I). Chlorine monoxide subsequently reacts with atomic oxygen, regenerating active chlorine radicals to perpetuate catalytic ozone destruction (III).

**133.** (A) Peroxyacetyl nitrate (PAN)
Photochemical smog forms through solar UV-driven reactions involving primary pollutants like nitrogen oxides and volatile organic compounds. These atmospheric photochemical reactions produce toxic secondary pollutants including tropospheric ozone and peroxyacetyl nitrate (PAN). PAN causes severe eye irritation and respiratory damage in urban environments during stagnant, sunny weather conditions.

**134.** (D) Carbon dioxide ($CO_2$)
While atmospheric water vapor is the largest natural greenhouse gas contributor, carbon dioxide represents the primary anthropogenic greenhouse gas driving recent global climate change. Emitted in massive volumes through fossil fuel combustion, deforestation, and industrial processes, accumulated carbon dioxide traps infrared radiation radiated from Earth's surface, accelerating anthropogenic warming trends worldwide.

**135.** (B) Eutrophication
Eutrophication occurs when agricultural fertilizer runoff carrying nitrates and phosphates enters

Click Here to Buy book on Amazon

or ultraviolet spectrum. Absorption of photons excites reactant electrons to higher energy levels, breaking specific chemical bonds. Both photosynthesis in plants and photolytic silver halide decomposition in photographic films represent classic photochemical reactions.

**117.** (A) Intense thermal energy (heat) capable of melting iron
The Thermite reaction involves the reduction of iron (III) oxide by reactive aluminum powder, producing aluminum oxide and iron. This single displacement redox reaction is extraordinarily exothermic, releasing intense thermal heat energy that raises temperatures above 2500°C. This extreme heat melts produced iron metal, making it ideal for welding railway tracks.

**118.** (D) Chemiluminescence
Chemiluminescence is the generation of light energy resulting directly from a chemical reaction, producing minimal associated heat output. Chemical energy released during electron transitions from excited reaction intermediates yields photons directly. When occurring within living organisms through enzyme-catalyzed oxidation like in fireflies, this cold light phenomenon is specifically referred to as bioluminescence.

**119.** (B) Chemical energy is converted into electrical energy.
A galvanic or voltaic cell converts chemical energy into electrical energy through spontaneous redox reactions. Oxidation occurs at the anode and reduction occurs at the cathode, generating electron transfer through an external circuit. This spontaneous movement of electrons generates usable direct current electricity, forming the foundational operating mechanism for commercial batteries.

**120.** (C) Finely divided iron
The Haber-Bosch process synthesizes ammonia gas from elemental nitrogen and hydrogen gases under high temperature and pressure. Finely divided iron, typically promoted with small quantities of potassium oxide and aluminum oxide, serves as a heterogeneous catalyst. It adsorbs reactant gas molecules onto its surface, lowering activation energy and accelerating reaction rate.

**121.** (B) I and IV only
In the Contact process, sulphur dioxide oxidizes to sulphur trioxide using a vanadium (V) oxide catalyst (I). This oxidation step is reversible and highly exothermic, making statement II false. Direct absorption into water produces dangerous acid mist, so sulphur trioxide is absorbed into concentrated sulphuric acid forming oleum (IV), making statements I and IV correct.

**122.** (A) Sodium carbonate (Washing soda)
The Solvay process is a major industrial chemical process utilized for manufacturing sodium carbonate, commonly known as washing soda. The process involves reacting sodium chloride, ammonia, and carbon dioxide in water to yield sodium bicarbonate precipitate, which is subsequently calcined thermally to produce pure sodium carbonate alongside recyclable ammonium chloride byproducts.

NODIA

**123.** (B) Differences in their boiling points
Petroleum refining employs fractional distillation to separate complex crude oil mixtures into commercial hydrocarbon fractions such as gasoline, kerosene, and diesel. Separation relies on distinct differences in boiling points among component molecules. As heated crude oil rises through a fractionating column, hydrocarbons condense at specific height zones corresponding to their boiling temperatures.

**124.** (B) It decomposes to form CaO, which reacts with silica impurities to form a molten slag.
In iron extraction inside a blast furnace, limestone thermally decomposes at high temperatures into calcium oxide and carbon dioxide. Calcium oxide acts as a basic flux, reacting chemically with sandy acidic silica impurities present in hematite ore to produce liquid calcium silicate slag. Molten slag floats atop dense liquid iron and is easily removed.

**125.** (A) Vulcanization
Vulcanization is an industrial chemical process where crude natural rubber is heated with sulphur additives. Sulphur atoms react with polyisoprene double bonds to form covalent cross-links between adjacent polymer chains. These chemical cross-links significantly improve tensile strength, elasticity, thermal stability, and mechanical durability, converting soft sticky rubber into durable elastomer suitable for tires.

# CHAPTER 17
# Acids, Bases and Salts

**1.** Which of the following statements most accurately defines an acid according to the classical Arrhenius theory?
(A) A substance that donates an electron pair in a coordinate covalent bond.
(B) A substance that dissociates in water to yield hydrogen ions.
(C) A substance that accepts a proton from a base in any solvent.
(D) A substance that yields hydroxide ions when dissolved in an aqueous medium.

**2.** When a dilute acid reacts with a typical active metal like zinc, which gas is characteristically evolved?
(A) Hydrogen gas
(B) Oxygen gas
(C) Carbon dioxide gas
(D) Nitrogen dioxide gas

**3.** Non-metal oxides generally exhibit which of the following chemical natures when dissolved in water?
(A) Basic
(B) Neutral
(C) Acidic
(D) Amphoteric

**4.** Which of the following is an everyday example of a natural substance containing a significant amount of tartaric acid?
(A) Sour milk
(B) Lemon
(C) Tomato
(D) Tamarind

**5.** In a typical reaction between an acid and a metal carbonate, what are the primary products formed?
(A) Salt and hydrogen gas
(B) Metal oxide, water, and carbon monoxide
(C) Salt, water, and carbon dioxide
(D) Metal hydroxide and carbon dioxide

**6.** Consider the following statements regarding the general properties of aqueous acid solutions:
I. They conduct electricity due to the presence of free ions.
II. They turn red litmus paper blue.
III. They have a sour taste.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**7.** What specifically defines an "alkali" in the context of chemical bases?
(A) Any base that can neutralize a strong acid.
(B) A base that contains both oxygen and hydrogen.
(C) Any organic compound that acts as a proton acceptor.
(D) A base that is highly soluble in water.

**8.** Which of the following chemical equations represents the reaction of a base with a non-metal oxide?
(A) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
(B) $NaOH + HCl \rightarrow NaCl + H_2O$
(C) $ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$
(D) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

**9.** Which of the following compounds is classified as a base but is not considered an alkali because of its insolubility in water?
(A) Sodium hydroxide (NaOH)
(B) Potassium hydroxide (KOH)
(C) Copper(II) hydroxide ($Cu(OH)_2$)
(D) Barium hydroxide ($Ba(OH)_2$)

**10.** Match the common names of basic compounds in List I with their corresponding chemical formulas in List II.
**List I: (Common Name)**
P. Quicklime
Q. Slaked lime
R. Milk of magnesia
S. Caustic soda
**List II: (Chemical Formula)**
1. NaOH
2. $Mg(OH)_2$
3. CaO

Downloaded from www.pdf.tube

(C) Sodium metal, chlorine gas, and water
(D) Sodium hypochlorite, hydrogen gas, and oxygen gas

**54.** Ammonium hydroxide ($NH_4OH$) is uniquely distinct from bases like NaOH and KOH because it:
(A) Exists solely as a stable, highly reactive strong base in pure solid form.
(B) Is a weak aqueous base that readily decomposes upon heating.
(C) Turns red litmus paper directly to an irreversible permanent green color.
(D) Cannot neutralize strong mineral acids under standard laboratory conditions.

**55.** In the saponification process, which base is typically used to manufacture "soft" liquid soaps as opposed to hard bar soaps?
(A) Sodium hydroxide
(B) Calcium hydroxide
(C) Magnesium hydroxide
(D) Potassium hydroxide

**56.** Which of the following hydroxides is sparingly soluble in water and is generally NOT considered a strong base?
(A) Lithium hydroxide
(B) Aluminum hydroxide
(C) Sodium hydroxide
(D) Barium hydroxide

**57.** Which type of salt is formed when a polyprotic acid is only partially neutralized by a base?
(A) Normal salt
(B) Basic salt
(C) Complex salt
(D) Acidic salt

**58.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** An aqueous solution of sodium carbonate ($Na_2CO_3$) turns red litmus paper blue.
**Reason (R):** Sodium carbonate is a salt of a strong acid and a weak base, resulting in an acidic solution upon hydrolysis.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**59.** How does a double salt, such as Mohr's salt, differ structurally and chemically from a complex salt in an aqueous solution?
(A) A double salt is highly covalent in nature, whereas a complex salt is always purely ionic in solution.
(B) A double salt contains only one single type of cation, while a complex salt contains multiple distinct cations.
(C) Double salts yield simple ions in solution, whereas complex salts retain complex ions.
(D) A double salt cannot conduct electricity in aqueous solution, unlike a highly conducting complex salt.

**60.** Choose the correct sequence of the following 0.1 M aqueous salt solutions arranged in increasing order of their pH values.
(A) Ammonium chloride, Sodium chloride, Sodium acetate, Sodium carbonate
(B) Sodium carbonate, Sodium acetate, Sodium chloride, Ammonium chloride
(C) Sodium chloride, Ammonium chloride, Sodium carbonate, Sodium acetate
(D) Ammonium chloride, Sodium acetate, Sodium chloride, Sodium carbonate

**61.** Basic salts contain replaceable hydroxide ions. Which of the following is a classic example of a basic salt?
(A) Calcium chloride ($CaCl_2$)
(B) Potassium hydrogen carbonate ($KHCO_3$)
(C) Sodium potassium sulfate ($NaKSO_4$)
(D) Basic copper carbonate

**62.** Which of the following correctly pairs a chemical salt with its constituent acid-base origin?
(A) Potassium cyanide (KCN) - Strong acid and Strong base
(B) Ammonium nitrate ($NH_4NO_3$) - Strong acid and Weak base
(C) Sodium sulfate ($Na_2SO_4$) - Weak acid and Strong base
(D) Calcium carbonate ($CaCO_3$) - Strong acid and Strong base

NODIA

**63.** In the industrial chemical context, the term "brine" specifically refers to:
(A) A dilute solution of sulfuric acid used for pickling.
(B) Any mixture of a strong acid and a weak base.
(C) A concentrated aqueous solution of sodium chloride.

activity
(B) The natural logarithm of the hydroxide ion concentration
(C) The ratio of acid concentration to base concentration
(D) The reciprocal of the acid dissociation constant

**23.** If a solution has a pH of 4, what is its hydrogen ion concentration in moles per liter?
(A) 4.0 M
(B) 0.4 M
(C) $10^{-4}$ M
(D) $10^{4}$ M

**24.** What happens to the pH of an acidic solution when it is significantly diluted with pure water?
(A) The pH decreases, approaching zero.
(B) The pH remains completely unchanged.
(C) The pH becomes greater than 7.
(D) The pH increases, approaching 7.

**25.** Which statement accurately describes the relationship between the ionic product of water (Kw) and temperature?
(A) Kw decreases as temperature increases, causing neutral water pH to exceed 7.
(B) Kw remains constant at all temperatures, keeping neutral water pH at exactly 7.
(C) Kw increases with temperature, dropping neutral water pH below 7.
(D) Kw is entirely independent of temperature variations in aqueous systems.

**26.** Consider the following statements about the pH scale in daily life:
I. The pH of normal rain is strictly 7.0.
II. Human blood operates optimally within a narrow pH range of 7.35 to 7.45.
III. The stomach secretes hydrochloric acid which significantly lowers its pH to aid digestion.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**27.** What is the approximate pH of a $10^{-8}$ M solution of hydrochloric acid (HCl) at 25 degrees Celsius?
(A) Slightly above 8.0
(B) Exactly equal to 7.0
(C) Slightly below 6.0
(D) Slightly below 7.0

**28.** Which of the following correctly describes the color change of the indicator phenolphthalein?
(A) Colorless in acidic solution and pink in basic solution
(B) Pink in acidic solution and colorless in basic solution
(C) Red in acidic solution and yellow in basic solution
(D) Yellow in acidic solution and red in basic solution

**29.** Litmus, a naturally occurring acid-base indicator, is primarily extracted from which biological source?
(A) Red cabbage leaves
(B) Turmeric roots
(C) Lichens
(D) Petunias

**30.** Arrange the following substances in increasing order of their typical pH values.
1. Lemon juice
2. Human blood
3. Gastric juice
4. Household ammonia
(A) 3, 1, 2, 4
(B) 1, 3, 2, 4
(C) 3, 1, 4, 2
(D) 1, 3, 4, 2

**31.** A universal indicator is uniquely advantageous over a simple indicator like litmus because it:
(A) Retains its initial color across all acidic media and changes color only at exactly pH 7.
(B) Does not undergo chemical degradation or precipitation when mixed with strong acids.
(C) Is naturally derived, environmentally benign, and highly stable at high temperatures.
(D) Displays distinct color changes corresponding to different pH values.

**32.** Consider the following statements regarding olfactory indicators:
I. Their odor changes in acidic or basic media.
II. Vanilla extract loses its characteristic smell in a basic medium.
III. Clove oil retains its smell in an acidic medium.
IV. They are primarily used by visually impaired students for acid-base detection.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only

Click Here to Buy book on Flipkart

(C) I, III, and IV only
(D) I, II, III, and IV

**33.** Identify the odd one out from the following list of acid-base indicators based on their origin.
(A) Red cabbage extract
(B) Turmeric
(C) Methyl orange
(D) Litmus

**34.** What fundamentally distinguishes a strong acid from a weak acid in an aqueous solution?
(A) The concentration of the acid in the solution.
(B) The number of oxygen atoms present in its molecular structure.
(C) Its ability to change the color of universal indicator.
(D) The degree of its dissociation into ions.

**35.** For a weak monobasic acid, the degree of dissociation (alpha) is typically:
(A) Exactly equal to 1.
(B) Much greater than 1.
(C) Less than 1, meaning it partially ionizes.
(D) Dependent entirely on atmospheric pressure.

**36.** Which of the following is considered a weak base?
(A) Sodium hydroxide
(B) Potassium hydroxide
(C) Barium hydroxide
(D) Ammonium hydroxide

**37.** Which of the following solutions will demonstrate the highest electrical conductivity under identical conditions of concentration and temperature?
(A) Aqueous acetic acid solution
(B) Aqueous formic acid solution
(C) Hydrochloric acid
(D) Aqueous carbonic acid solution

**38.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** A 1M solution of acetic acid is a poorer conductor of electricity than a 1M solution of sulfuric acid.
**Reason (R):** Acetic acid is a weak acid and provides a lower concentration of free ions in solution compared to a strong acid like sulfuric acid.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**39.** Which of the following statements correctly differentiates between strong and weak bases?
(A) Strong bases inherently contain carbon atoms, whereas weak bases never contain carbon.
(B) Strong bases fully ionize in solution, whereas weak bases ionize partially.
(C) Weak bases react violently with pure water, while strong bases react extremely slowly.
(D) Strong bases turn blue litmus paper red, whereas weak bases have no effect on litmus paper.

NODIA

**40.** Match the everyday neutralization applications in List I with the corresponding active substances in List II.
**List I: (Application)**
P. Treating acidity in the stomach
Q. Neutralizing acidic soil in agriculture
R. Treating a bee sting
S. Treating a wasp sting
**List II: (Substance)**
1. Slaked lime
2. Vinegar
3. Baking soda
4. Milk of magnesia
(A) P-4, Q-1, R-3, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-4, R-2, S-3

**41.** The standard enthalpy of neutralization for a strong acid reacting with a strong base in dilute aqueous solution is approximately constant. What is this value?
(A) +13.7 kcal/mol (+57.1 kJ/mol)
(B) -393.5 kJ/mol
(C) -13.7 kcal/mol (-57.1 kJ/mol)
(D) -285.8 kJ/mol

**42.** Which active chemical component is most commonly utilized in commercial antacid tablets to relieve indigestion?
(A) Magnesium hydroxide
(B) Sodium hydroxide
(C) Calcium chloride
(D) Potassium nitrate

**43.** Why is baking soda paste an effective first-aid treatment for a bee sting but ineffective for a wasp sting?
(A) A bee sting is highly alkaline in nature, and

baking soda acts as an effective weak acid buffer.
(B) Baking soda physically draws out the stinger but plays no active chemical neutralization role.
(C) Bee stings are acidic and neutralized by baking soda, while wasp stings are alkaline.
(D) A bee sting contains a weak organic base, while a wasp sting contains a concentrated strong acid.

**44.** What is the fundamental net ionic equation that accurately represents the neutralization of any strong acid by any strong base in an aqueous medium?
(A) $H+(aq) + Cl-(aq) \rightarrow HCl(l)$
(B) $Na+(aq) + OH-(aq) \rightarrow NaOH(aq)$
(C) $H_3O+(aq) + H_2O(l) \rightarrow 2H_2O(l)$
(D) $H+(aq) + OH-(aq) \rightarrow H_2O(l)$

**45.** Which of the following common mineral acids is industrially referred to as the "King of Chemicals" due to its widespread application in manufacturing?
(A) Nitric acid ($HNO_3$)
(B) Hydrochloric acid (HCl)
(C) Sulfuric acid ($H_2SO_4$)
(D) Phosphoric acid ($H_3PO_4$)

**46.** Consider the following statements about Nitric Acid ($HNO_3$):
I. It is a strong oxidizing agent that oxidizes hydrogen gas to water when reacting with most metals.
II. It is manufactured industrially via the Contact Process.
III. It is a primary component used in the manufacturing of TNT (Trinitrotoluene).
Which of the above statement(s) is/are incorrect?
(A) I only
(B) II only
(C) I and III only
(D) II and III only

**47.** Aqua regia is a highly corrosive mixture capable of dissolving noble metals like gold and platinum. What is its exact composition by volume?
(A) 3 parts concentrated $HNO_3$ and 1 part concentrated HCl
(B) 1 part concentrated $H_2SO_4$ and 3 parts concentrated $HNO_3$
(C) Equal parts of concentrated HCl and concentrated $H_2SO_4$
(D) 3 parts concentrated HCl and 1 part concentrated $HNO_3$

**48.** Which acid is primarily utilized as the electrolyte in traditional lead-acid car batteries?
(A) Sulfuric acid
(B) Acetic acid
(C) Hydrochloric acid
(D) Nitric acid

**49.** Hydrochloric acid (HCl) is extensively used in various industries. Which of the following is NOT a typical commercial application of HCl?
(A) Pickling of steel to remove rust before galvanizing
(B) Manufacturing of polyvinyl chloride (PVC) plastics
(C) Production of ammonium nitrate fertilizers
(D) Cleaning of boilers (descaling)

**50.** The Ostwald process is a key industrial chemical method. Which common acid is synthesized using this process?
(A) Sulfuric acid
(B) Hydrochloric acid
(C) Phosphoric acid
(D) Nitric acid

**51.** The common laboratory base Potassium Hydroxide (KOH) is also known by which commercial name?
(A) Caustic soda
(B) Hydrated washing soda
(C) Slaked lime
(D) Caustic potash

**52.** Consider the following applications of sodium hydroxide (NaOH):
I. Manufacturing of soaps and detergents.
II. Refining of bauxite ore to obtain alumina.
III. Used as a preservative in the food industry.
IV. Paper and pulp manufacturing.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, and III only

**53.** The industrial electrolysis of aqueous sodium chloride is known as the chlor-alkali process. What are the three crucial products formed in this process?
(A) Sodium carbonate, chlorine gas, and oxygen gas
(B) Sodium hydroxide, chlorine gas, and hydrogen gas

NODIA

**93.** While some crops have specific needs, agricultural science dictates that the optimal soil pH range for the maximal availability of essential nutrients for most terrestrial plants is:
(A) 4.5 to 5.5
(B) 8.0 to 9.0
(C) 6.5 to 7.5
(D) 9.5 to 10.5

**94.** If an agricultural soil is tested and found to be excessively acidic, a farmer is most likely to amend the soil by incorporating:
(A) Ammonium nitrate fertilizer
(B) Natural sphagnum peat moss
(C) Fine elemental sulfur powder
(D) Quicklime or slaked lime

**95.** Conversely, to treat and reclaim highly alkaline soils, which chemical amendment is most frequently and cost-effectively applied?
(A) Agricultural gypsum
(B) Ground calcium carbonate
(C) Refined sodium chloride
(D) Solid potassium hydroxide

**96.** Certain plant species act as natural biological indicators of soil pH. For example, the flowers of Hydrangea macrophylla naturally bloom blue in which type of soil?
(A) Strongly alkaline soil
(B) Acidic soil
(C) Strictly neutral soil
(D) Saline-sodic soil

**97.** Which of the following agricultural practices is widely considered an incorrect or harmful method for purposefully adjusting soil pH?
(A) Applying agricultural limestone routinely to systematically raise the soil pH level.
(B) Applying finely ground elemental sulfur to gradually lower soil pH over time.
(C) Flushing fields with concentrated sulfuric acid to lower soil pH rapidly.
(D) Incorporating well-rotted organic matter or compost to buffer overall soil pH.

**98.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Gypsum is extensively used in the reclamation of sodic soils in arid regions like Rajasthan.
**Reason (R):** Gypsum provides soluble calcium that replaces excess exchangeable sodium on the clay particles, improving soil structure.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**99.** Temporary hardness in municipal or ground water is chemically attributed to the presence of:
(A) Dissolved chlorides of calcium and magnesium
(B) Dissolved sulfates of calcium and magnesium
(C) Soluble nitrates of sodium and potassium
(D) Bicarbonates of calcium and magnesium

**100.** Match the water softening method in List I with its primary chemical mechanism in List II.
**List I: (Water Softening Method)**
P. Boiling
Q. Clark's method
R. Calgon's method
S. Ion-exchange resin
**List II: (Chemical Mechanism)**
1. Forms soluble complex with Ca/Mg ions to keep them in solution
2. Replaces Ca/Mg ions with Na ions via a synthetic polymer matrix
3. Converts soluble bicarbonates to insoluble carbonates via thermal decomposition
4. Adds calculated amount of lime to precipitate calcium carbonate
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-2, R-3, S-4

**101.** Permanent hardness of water, which cannot be removed by simple prolonged boiling, is primarily caused by dissolved:
(A) Calcium sulfate and magnesium chloride
(B) Sodium chloride and potassium chloride
(C) Calcium bicarbonate and magnesium bicarbonate
(D) Iron(III) hydroxide and aluminum oxide

**102.** When water containing temporary hardness is boiled, a white scale often deposits on the inner walls of the vessel. This precipitate is predominantly:
(A) Calcium sulfate
(B) Calcium carbonate
(C) Magnesium chloride
(D) Sodium bicarbonate

Downloaded from www.pdf.tube

(D) The molten state of a pure metal ore.

**64.** During the electrolysis of brine in the chlor-alkali process, where do the principal gases collect?
(A) Chlorine at the cathode and Hydrogen at the anode
(B) Both gases collect simultaneously at the cathode
(C) Oxygen at the anode and Chlorine at the cathode
(D) Chlorine at the anode and Hydrogen at the cathode

**65.** Sodium chloride (NaCl) is a foundational raw material for many industrial chemicals. Which of the following is NOT manufactured using NaCl as a primary raw material?
(A) Baking soda ($NaHCO_3$)
(B) Washing soda ($Na_2CO_3 \cdot 10H_2O$)
(C) Plaster of Paris
(D) Bleaching powder ($CaOCl_2$)

**66.** Consider the physiological roles of sodium chloride in the human body:
I. It is essential for the generation of nerve impulses.
II. It helps maintain the osmotic balance of bodily fluids.
III. It provides the chloride ions necessary for the production of gastric hydrochloric acid.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**67.** Large crystals of naturally occurring rock salt often appear brown. What is the primary chemical reason for this coloration?
(A) Prolonged atmospheric exposure to intense ultraviolet radiation from the sun.
(B) Presence of entrapped earthly impurities and trace minerals.
(C) Partial chemical decomposition of sodium chloride into metallic sodium.
(D) The inherent natural crystalline color of large sodium chloride lattices.

**68.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Sodium chloride is widely spread on icy roads in colder regions during winter.
**Reason (R):** Adding sodium chloride to ice depresses the freezing point of water, causing the ice to melt even at sub-zero temperatures.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

NODIA

**69.** A chemical base can be "strong" yet "sparingly soluble". Which of the following best exemplifies this characteristic?
(A) Sodium hydroxide
(B) Calcium hydroxide
(C) Ammonium hydroxide
(D) Pyridine

**70.** Match the solubility product condition in List I with the corresponding solution state in List II.
**List I: (Solubility Product Condition)**
P. Ionic product $<$ Ksp
Q. Ionic product $=$ Ksp
R. Ionic product $>$ Ksp
S. Addition of a common ion
**List II: (Solution State)**
1. Precipitation occurs
2. Saturated solution
3. Unsaturated solution (no precipitation)
4. Decrease in solubility
(A) P-3, Q-2, R-1, S-4
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-3, R-4, S-1

**71.** Alkali metals generally form hydroxides that exhibit which defining property compared to transition metal hydroxides?
(A) They are completely insoluble in pure water under normal conditions.
(B) They undergo rapid decomposition easily upon mild thermal heating.
(C) They act as weak bases exhibiting a very low degree of dissociation.
(D) They are highly soluble in water, forming strong alkalis.

**72.** Consider the following statements regarding the solubility of salts in water:
I. All common sodium, potassium, and ammonium salts are soluble.
II. All common nitrates and acetates are soluble.
III. All common chlorides are soluble, except those of silver, lead, and mercury(I).

IV. All carbonates are soluble, without exception.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) III only
(C) IV only
(D) II and IV only

**73.** Which of the following is considered a sparingly soluble salt in an aqueous medium at room temperature?
(A) Potassium sulfate ($K_2SO_4$)
(B) Sodium nitrate ($NaNO_3$)
(C) Silver chloride (AgCl)
(D) Ammonium chloride ($NH_4Cl$)

**74.** What is the predictable effect of adding a concentrated solution of sodium chloride (NaCl) to a saturated aqueous solution of silver chloride (AgCl)?
(A) More AgCl will dissolve into solution due to significantly increased ionic strength.
(B) The equilibrium solubility of AgCl remains entirely unaffected in solution.
(C) Silver metal will be chemically reduced and plate out of the liquid solution.
(D) AgCl precipitates out due to the common ion effect.

**75.** Which prominent organic acid is responsible for the characteristic sour taste of citrus fruits like lemons and oranges?
(A) Malic acid
(B) Tartaric acid
(C) Ascorbic acid
(D) Citric acid

**76.** Vinegar, commonly used as a food preservative and flavoring agent, is essentially a dilute aqueous solution of which acid?
(A) Acetic acid
(B) Formic acid
(C) Propanoic acid
(D) Butyric acid

**77.** The painful irritation caused by the sting of an ant or a nettle leaf is primarily due to the injection of:
(A) Ethanoic acid
(B) Hydrochloric acid
(C) Methanoic acid
(D) Lactic acid

**78.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Aqueous solutions of standard household soaps are basic in nature.
**Reason (R):** Soaps are sodium or potassium salts of long-chain weak fatty acids, which undergo hydrolysis in water to produce OH- ions.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**79.** Which specific organic acid is frequently employed in household cleaners specifically formulated to remove stubborn rust or iron stains from clothing and porcelain?
(A) Acetic acid
(B) Citric acid
(C) Lactic acid
(D) Oxalic acid

**80.** Arrange the following everyday substances in order of strictly increasing pH value.
1. Tomato juice
2. Pure water
3. Liquid bleach
4. Human saliva (before a meal)
(A) 1, 4, 2, 3
(B) 1, 2, 4, 3
(C) 4, 1, 2, 3
(D) 1, 2, 3, 4

**81.** Normal unpolluted rainwater is slightly acidic due to dissolved atmospheric carbon dioxide. Below what specific pH threshold is precipitation officially classified as "acid rain"?
(A) 7.0
(B) 6.5
(C) 4.0
(D) 5.6

**82.** The principal non-metal oxides responsible for the formation of severe acid rain as secondary atmospheric pollutants are:
(A) Sulfur dioxide and nitrogen dioxide
(B) Carbon monoxide and carbon dioxide
(C) Methane and ozone
(D) Chlorofluorocarbons and nitrous oxide

**83.** The phenomenon of "marble cancer," which degrades historic monuments like the Taj Mahal, is a chemical reaction primarily between calcium carbonate and which component of acid rain?
(A) Carbonic acid

Click Here to Buy book on Amazon

(B) Hydrochloric acid
(C) Sulfuric acid
(D) Phosphoric acid

**84.** Which of the following is NOT a recognized environmental consequence of acid rain?
(A) Leaching of toxic heavy metals like aluminum into water bodies.
(B) Accelerated corrosion of structural steel and limestone buildings.
(C) Reduction in soil fertility due to the washout of essential nutrients.
(D) Depletion of the stratospheric ozone layer.

**85.** Acid deposition occurs in two forms: wet and dry. Which statement correctly distinguishes them?
(A) Wet deposition strictly occurs over oceanic regions, while dry deposition occurs exclusively over continental landmasses.
(B) Wet deposition includes rain and snow, whereas dry deposition involves acidic gases and settling particles.
(C) Wet deposition involves strictly aqueous sulfuric acid, while dry deposition involves airborne nitric acid vapor.
(D) Dry deposition causes virtually no measurable environmental or ecological harm compared to wet precipitation.

**86.** Consider the following statements about the impact of acid rain:
I. It dramatically increases the pH of lake water, threatening aquatic life.
II. It severely damages plant cuticles and reduces photosynthetic capacity.
III. It promotes the release of calcium and magnesium from soils, flushing them away.
Which of the above statement(s) is/are incorrect?
(A) I only
(B) II only
(C) I and III only
(D) II and III only

**87.** To maintain homeostasis, the pH of healthy human blood is tightly regulated within which narrow numerical range?
(A) 6.50 to 6.80
(B) 7.00 to 7.10
(C) 7.80 to 8.00
(D) 7.35 to 7.45

**88.** The highly acidic gastric juice in the human stomach facilitates the activation of which crucial digestive enzyme?
(A) Pepsin
(B) Salivary amylase
(C) Trypsin
(D) Lipase

**89.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Tooth decay accelerates significantly when the pH of the mouth falls below 5.5.
**Reason (R):** The enamel, composed of calcium hydroxyapatite, becomes highly soluble and begins to corrode in an acidic environment.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

NODIA

**90.** The primary chemical buffer system responsible for resisting rapid pH changes in human blood plasma is:
(A) The acetic acid/acetate system
(B) The hydrochloric acid/chloride system
(C) The carbonic acid/bicarbonate system
(D) The citric acid/citrate system

**91.** Severe muscle cramps during rigorous anaerobic exercise are directly linked to a localized drop in pH caused by the accumulation of:
(A) Carbonic acid
(B) Pyruvic acid
(C) Uric acid
(D) Lactic acid

**92.** Consider the mechanisms by which the human body maintains acid-base balance:
I. Chemical buffers in the blood act instantly.
II. The respiratory system adjusts the exhalation of carbon dioxide.
III. The kidneys excrete or reabsorb hydrogen and bicarbonate ions.
IV. The liver sequesters hydrochloric acid to balance blood pH.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and II only
(D) I, II, III, and IV

4. $Ca(OH)_2$
(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-2, R-4, S-1
(D) P-1, Q-4, R-2, S-3

**11.** The process of salt formation through the interaction of an acid and a base is fundamentally characterized by the combination of which two ions?
(A) Sodium ions and chloride ions
(B) Metal cations and non-metal anions
(C) Hydronium ions and hydronium ions
(D) Hydrogen ions and hydroxide ions

**12.** Consider the following statements regarding the methods of preparing various salts:
I. Direct synthesis from constituent elements.
II. Reaction of a metal with a dilute acid.
III. Reaction of a metal carbonate with an acid.
IV. Thermal decomposition of a stable metal oxide.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, III, and IV only

**13.** A basic salt is defined chemically as a salt that contains which of the following?
(A) Unreplaced hydrogen ions from the parent acid
(B) Only normal cations and anions with no remaining acidic or basic groups
(C) Replaceable hydroxide ions from the parent base
(D) A complex ion formed by coordinate covalent bonds

**14.** Which among the following is an example of an acidic salt?
(A) Sodium chloride (NaCl)
(B) Potassium nitrate ($KNO_3$)
(C) Calcium carbonate ($CaCO_3$)
(D) Sodium hydrogen sulfate ($NaHSO_4$)

**15.** When sodium reacts vigorously with water, the resulting solution contains a base. Which gas is released as a byproduct?
(A) Hydrogen
(B) Oxygen
(C) Carbon dioxide
(D) Nitrogen

**16.** According to the Bronsted-Lowry theory, an acid-base reaction essentially involves the transfer of which entity?
(A) An electron pair
(B) A proton
(C) A hydroxide ion
(D) A hydride ion

**17.** How does the Lewis theory define an acid?
(A) As an electron-pair donor
(B) As a proton donor
(C) As a substance that yields $H^+$ in water
(D) As an electron-pair acceptor

**18.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Boron trifluoride ($BF_3$) acts as an acid despite having no hydrogen atoms in its structure.
**Reason (R):** $BF_3$ has an incomplete octet and can accept a lone pair of electrons.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**19.** Identify the conjugate base of the hydronium ion ($H_3O^+$) in an aqueous solution.
(A) $OH^-$
(B) $H^+$
(C) $H_2O$
(D) $O_2$-

**20.** Select the correct order of the following compounds arranged in decreasing order of their acidic strength in aqueous solution.
(A) $HClO_4 > H_2SO_4 > HNO_3 > H_3PO_4$
(B) $H_2SO_4 > HClO_4 > H_3PO_4 > HNO_3$
(C) $H_3PO_4 > HNO_3 > H_2SO_4 > HClO_4$
(D) $HNO_3 > H_2SO_4 > HClO_4 > H_3PO_4$

**21.** Which of the following molecules acts primarily as a Lewis base due to the presence of a non-bonding pair of electrons?
(A) $AlCl_3$
(B) $CH_4$
(C) $BF_3$
(D) $NH_3$

**22.** The mathematical definition of the pH scale is based on which of the following?
(A) The negative logarithm of the hydrogen ion

Downloaded from www.pdf.tube

**103.** The commercial compound known as "Calgon," utilized extensively in industrial water softening to tie up calcium ions without precipitating them, is chemically:
(A) Sodium carbonate decahydrate
(B) Calcium hydroxide
(C) Sodium hexametaphosphate
(D) Zeolite

**104.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Synthetic ion-exchange resins are highly efficient for producing entirely demineralized (deionized) water.
**Reason (R):** They sequentially pass the hard water through a cation exchange bed releasing H+ ions, and an anion exchange bed releasing OH- ions.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**105.** In a laboratory acid-base titration, what specific term describes the exact theoretical point at which the number of moles of added titrant stoichiometrically equals the moles of the analyte?
(A) The end point
(B) The neutralization boundary
(C) The inflection limit
(D) The equivalence point

**106.** Consider the choice of indicators for various acid-base titrations:
I. Phenolphthalein is suitable for strong acid vs strong base.
II. Methyl orange is suitable for strong acid vs weak base.
III. Phenolphthalein is suitable for weak acid vs strong base.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

**107.** What is the standard definition of a "standard solution" in the context of volumetric titration?
(A) Any chemical solution whose exact volumetric amount remains completely unknown.
(B) Any aqueous solution that naturally maintains a constant neutral pH value of 7.
(C) Any liquid reagent solution containing a high concentration of a strong acid.
(D) A solution of precisely known concentration used as a reference titrant.

**108.** When plotting a titration curve for the progressive addition of a strong acid to a weak base, the pH at the equivalence point will typically be:
(A) Less than 7.0
(B) Exactly 7.0
(C) Greater than 7.0
(D) Exactly 14.0

**109.** An ideal primary standard is crucial for accurate titrations. Which of the following chemicals is generally NOT suitable to act as a primary standard due to its highly hygroscopic nature?
(A) Sodium carbonate ($Na_2CO_3$)
(B) Potassium dichromate ($K_2Cr_2O_7$)
(C) Sodium hydroxide (NaOH)
(D) Oxalic acid ($H_2C_2O_4 \cdot 2H_2O$)

NODIA

**110.** In a titration, 25.0 mL of 0.2 M NaOH is required to completely neutralize 50.0 mL of an HCl solution. What is the molarity of the HCl solution?
(A) 0.2 M
(B) 0.4 M
(C) 0.1 M
(D) 0.05 M

**111.** Which of the following provides the most accurate chemical definition of an amphoteric oxide?
(A) An oxide that chemically fails to react with either strong acids or strong bases.
(B) An oxide that reacts exclusively with hot, highly concentrated strong bases.
(C) An oxide that reacts with both acids and bases to produce salt and water.
(D) An oxide that readily dissolves in water to yield a highly acidic dibasic solution.

**112.** Consider the following metallic oxides:
I. Zinc oxide (ZnO)
II. Aluminum oxide ($Al_2O_3$)
III. Magnesium oxide (MgO)
IV. Lead(II) oxide (PbO)
Which of the above options contains an oxide that is not amphoteric?
(A) I, II, and III
(B) I, II, and IV
(C) II, III, and IV

(D) I and III only

**113.** When solid aluminum oxide ($Al_2O_3$) is heated with a concentrated solution of sodium hydroxide (NaOH), it undergoes an amphoteric reaction. What is the primary soluble product formed?
(A) Aluminum hydroxide
(B) Sodium aluminate
(C) Aluminum carbonate
(D) Sodium aluminum hydride

**114.** Which of the following common oxides is purely acidic and categorically not amphoteric?
(A) Sulfur trioxide ($SO_3$)
(B) Zinc oxide (ZnO)
(C) Tin(II) oxide (SnO)
(D) Beryllium oxide (BeO)

**115.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Many metalloids (such as arsenic and antimony) form amphoteric oxides.
**Reason (R):** Metalloids sit precisely on the boundary between metals and non-metals in the periodic table, showing intermediate electronegativity.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**116.** Identify the correct pairing of the chemical element with the fundamental nature of its most common oxide.
(A) Sodium - Acidic
(B) Phosphorus - Basic
(C) Nitrogen - Acidic
(D) Calcium - Amphoteric

**117.** Which strong mineral acid is consumed in massive industrial quantities worldwide specifically for the production of phosphate fertilizers like superphosphate?
(A) Hydrochloric acid
(B) Sulfuric acid
(C) Nitric acid
(D) Acetic acid

**118.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Sulfuric acid and hydrochloric acid are heavily utilized in the metallurgical process known as "pickling" steel.
**Reason (R):** They react with and dissolve the layer of iron oxide rust on the surface of the steel, leaving the base metal clean for coating.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**119.** Nitric acid ($HNO_3$) finds dual use in both the agricultural and defense industries. What are its two most dominant derivative products?
(A) Nitrogen fertilizers and industrial explosives
(B) Polyvinyl chloride (PVC) pipes, structural polymers, and synthetic rubbers
(C) Commercial chlorine bleaching agents and municipal chemical water softeners
(D) Over-the-counter antacid formulations and specialized pharmaceutical buffers

**120.** Arrange the following common mineral acids in order of their typical global industrial production volume, from highest to lowest.
(A) Sulfuric acid > Nitric acid > Hydrochloric acid
(B) Hydrochloric acid > Sulfuric acid > Nitric acid
(C) Nitric acid > Sulfuric acid > Hydrochloric acid
(D) Sulfuric acid > Hydrochloric acid > Nitric acid

**121.** Ammonia is a crucial weak base produced industrially via the Haber process. What is its largest single application?
(A) Manufacturing of household glass cleaners
(B) Synthesis of nitrogenous fertilizers
(C) Production of baking powder
(D) Acting as an industrial refrigerant

**122.** When preparing a dilute acid solution from concentrated sulfuric acid in a laboratory, what is the mandatory safety protocol?
(A) Slowly add acid to water with constant stirring.
(B) Rapidly pour a measured volume of water directly into the concentrated acid to dissipate heat quickly.
(C) Mix equal volumetric parts of concentrated acid and water simultaneously inside a sealed glass container.

Click Here to Buy book on Flipkart

(D) Heat the distilled water to a boiling temperature before carefully introducing the concentrated acid reagent.

**123.** If a large amount of concentrated acid is accidentally spilled on a laboratory bench, what is the safest and most effective initial step to manage the chemical spill?
(A) Immediately wipe up the corrosive liquid directly using standard laboratory paper towels.
(B) Douse the acid spill with a highly reactive alkali like concentrated sodium hydroxide solution.
(C) Neutralize the acid spill with solid sodium bicarbonate.
(D) Flush the affected bench area repeatedly with large volumes of scalding boiling water.

**124.** Which of the following is considered a strictly prohibited and highly unsafe practice when handling chemical reagents in a chemistry laboratory?
(A) Wearing approved personal safety goggles while carefully handling dilute acetic acid or household vinegar.
(B) Storing highly volatile or fuming concentrated mineral acids inside a continuously operating exhaust fume hood.
(C) Using mouth suction to draw liquids into a pipette.
(D) Systematically labeling all secondary chemical containers with their full chemical names and specific health hazards.

**125.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Strong alkalis like sodium hydroxide should not be stored long-term in standard glass bottles with ground-glass stoppers.
**Reason (R):** Strong alkalis slowly react with the silicates in glass, which can etch the bottle and permanently cement the stopper in place.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**126.** Why is concentrated nitric acid traditionally stored in dark amber-colored glass bottles in chemical laboratories?
(A) It rapidly evaporates at room temperature, so dark amber glass naturally absorbs ambient heat to cool the liquid.
(B) It blocks light to prevent photochemical decomposition into $NO_2$ gas.
(C) It effectively prevents the hygroscopic acid from actively absorbing ambient moisture from surrounding laboratory air.
(D) Nitric acid aggressively attacks transparent clear glass surfaces through etching but cannot react with colored glass.

**127.** In physical chemistry, salt hydrolysis is fundamentally viewed as the reverse process of which fundamental reaction?
(A) Oxidation-reduction
(B) Neutralization
(C) Precipitation
(D) Crystallization

**128.** When ammonium chloride ($NH_4Cl$) is dissolved in pure water, the resulting solution will test as:
(A) Strongly basic, because it contains the ammonium ion.
(B) Neutral, because it is a salt.
(C) Acidic, due to the hydrolysis of the ammonium ion.
(D) Basic, due to the hydrolysis of the chloride ion.

**129.** The pH of a 0.1 M solution of sodium acetate ($CH_3COONa$) at 25 degrees Celsius will predictably be:
(A) Exactly equal to 7.0
(B) Significantly less than 7.0
(C) Exactly equal to 0.0
(D) Greater than 7.0

**130.** Match the salt in List I with the expected nature of its aqueous solution in List II.
**List I: (Salt)**
P. Sodium chloride (NaCl)
Q. Potassium cyanide (KCN)
R. Copper(II) sulfate ($CuSO_4$)
S. Ammonium acetate ($CH_3COONH_4$)
**List II: (Nature of Solution)**
1. Almost neutral (pH ~7, both ions hydrolyze)
2. Basic (pH $>$ 7)
3. Acidic (pH $<$ 7)
4. Neutral (no significant hydrolysis)
(A) P-4, Q-2, R-3, S-1

Downloaded from www.pdf.tube

aqueous equilibria, capable of accepting a proton to regenerate the hydronium ion.

**20.** (A) $HClO_4 > H_2SO_4 > HNO_3 > H_3PO_4$
Acidic strength in aqueous solution depends on the stability of the conjugate base formed after proton donation. Perchloric acid is the strongest mineral acid listed due to extensive resonance stabilization of its anion, followed by sulfuric acid, nitric acid, and phosphoric acid, which ionizes only partially in water owing to weaker central atom electronegativity and lower oxidation state.

**21.** (D) $NH_3$
Ammonia serves as a classical Lewis base because its central nitrogen atom possesses a non-bonding lone pair of valence electrons. This lone pair can be readily donated to electron-deficient species or metallic cations to form coordinate covalent bonds, unlike electron-deficient molecules like aluminum chloride or boron trifluoride which act as electron-pair acceptors in chemical reactions.

**22.** (A) The negative logarithm of the hydrogen ion activity
The pH scale is mathematically defined as the negative logarithm to base ten of the hydrogen ion activity or concentration in a given aqueous solution. This logarithmic formulation converts widely varying hydrogen ion concentrations into a simple numerical range from zero to fourteen, where lower values indicate higher acidity and greater hydrogen ion availability in solution.

**23.** (C) $10^{-4}$ M
The mathematical expression relating pH to hydrogen ion concentration states that pH equals the negative logarithm of the hydrogen ion concentration in moles per liter. Rearranging this logarithmic formula reveals that the hydrogen ion concentration is equal to ten raised to the power of negative pH, yielding a concentration of ten to the minus four moles per liter.

**24.** (D) The pH increases, approaching 7.
Diluting an acidic solution with pure water lowers the concentration of dissolved hydrogen ions toward the neutral level present in water. As the hydronium ion concentration decreases logarithmic fashion, the pH value correspondingly increases. However, extensive dilution with neutral water causes the solution pH to continuously approach seven without ever exceeding it under ambient conditions.

**25.** (C) Kw increases with temperature, dropping neutral water pH below 7.
The auto-ionization of water is an endothermic process, meaning that increasing temperature shifts the equilibrium to favor further dissociation into hydrogen and hydroxide ions. Consequently, the ionic product of water increases with temperature, causing the equal concentrations of hydrogen and hydroxide ions to rise, which shifts the neutral pH value below seven without changing water's neutral nature.

**26.** (B) II and III only
Human blood is strictly buffered between 7.35 and 7.45 to maintain crucial biological functions, while stomach juice contains hydrochloric acid, creating a highly acidic environment with a low pH near 1.5 to facilitate digestion. Normal rainwater is naturally slightly acidic with a pH around 5.6 due to dissolved carbon dioxide, making unpolluted rain non-neutral.

**27.** (D) Slightly below 7.0
In extremely dilute hydrochloric acid solutions, the concentration of hydrogen ions supplied by the acid is comparable to the hydrogen ions originating from water's self-ionization. Factoring in both sources yields a total hydrogen ion concentration slightly above ten to the minus seven moles per liter, resulting in a calculated pH value that is strictly slightly below seven.

NODIA

**28.** (A) Colorless in acidic solution and pink in basic solution
Phenolphthalein is a synthetic organic acid-base indicator widely used in volumetric titrations. In acidic and neutral aqueous media, its molecular structure remains unionized and completely colorless. However, upon exposure to basic solutions with a pH above 8.3, it undergoes structural rearrangement into an ionized form that imparts a distinct vivid pink coloration to the solution.

**29.** (C) Lichens
Litmus is a widely used natural acid-base indicator extracted primarily from lichens, which are symbiotic organisms consisting of fungi and algae. The extracted dyes absorb specific wavelengths of light depending on ambient hydrogen ion concentration, turning red in acidic

carbonated soft drink releases a rapid fizz of bubbles.

**Reason (R):** The sudden drop in pressure causes dissolved carbonic acid to instantly decompose into carbon dioxide gas and water.

(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**140.** Arrange the chronological steps required to test the precise pH of a soil sample in an agricultural field laboratory.

1. Filter the suspension to obtain a clear liquid extract.
2. Mix the soil sample thoroughly with distilled water in a beaker.
3. Compare the color of the indicator strip against a standard pH color chart.
4. Dip a strip of universal indicator paper into the clear extract.

(A) 2, 1, 4, 3
(B) 1, 2, 4, 3
(C) 2, 4, 1, 3
(D) 4, 2, 1, 3

www.nodia.in

Click Here to Buy book on Amazon

# ANSWERS

**1.** (B) A substance that dissociates in water to yield hydrogen ions.
According to the classical Arrhenius theory of acids and bases, an acid is defined as any chemical compound that contains hydrogen atoms and dissociates when dissolved in an aqueous solution to produce hydrogen ions. This liberation of free hydrogen ions in water imparts characteristic acidic properties to the resulting solution, distinguishing it from basic or neutral substances.

**2.** (A) Hydrogen gas
Active metals located above hydrogen in the reactivity series readily undergo single displacement reactions when placed in contact with dilute acids. During this chemical process, the metal atoms displace hydrogen from the acid molecules, forming a soluble metal salt and liberating colorless, odorless hydrogen gas, which can be identified by a characteristic pop sound upon ignition.

**3.** (C) Acidic
Non-metal oxides are formed through the covalent bonding of oxygen with non-metallic elements. When dissolved in water, these oxides undergo a chemical reaction to produce acidic solutions containing excess hydrogen ions. Consequently, non-metal oxides are classified as acidic anhydrides because they neutralize aqueous bases and lower the overall pH of water below seven upon complete dissolution.

**4.** (D) Tamarind
Tamarind is a widely recognized natural plant resource that contains substantial amounts of tartaric acid, an organic dicarboxylic acid responsible for its distinct sour taste. Tartaric acid also naturally occurs in grapes and bananas, playing an important role in food chemistry as a antioxidant and flavoring agent while contributing to the natural preservation of plant tissues.

**5.** (C) Salt, water, and carbon dioxide
Reactions between acids and metal carbonates follow a standardized chemical pattern driven by the decomposition of intermediate carbonic acid. The acid reacts with the metallic carbonate to produce a corresponding soluble ionic salt, liquid water, and gaseous carbon dioxide, which causes brisk effervescence during the process and turns limewater milky when bubbled through it.

**6.** (C) I and III only
Aqueous acid solutions contain dissociated ions that move freely, enabling them to conduct electricity efficiently through electrolytic transport. Additionally, acids possess an inherently sour taste due to the presence of hydronium ions. However, acids turn blue litmus paper red rather than red litmus blue, rendering only specific chemical descriptions of acid behavior accurate in aqueous media.

NODIA

**7.** (D) A base that is highly soluble in water.
In chemical terminology, an alkali is specifically defined as a water-soluble base that dissociates completely or partially in aqueous solution to yield hydroxide ions. While all alkalis are fundamentally chemical bases due to their hydroxide content and basic nature, not all bases are classified as alkalis because many metallic hydroxides and oxides remain entirely insoluble in water.

**8.** (A) $Ca(OH)2 + CO_2 \rightarrow CaCO_3 + H_2O$
Non-metal oxides possess acidic characteristics, allowing them to react with basic hydroxides to undergo neutralization. The chemical reaction between calcium hydroxide and carbon dioxide demonstrates this principle directly, forming insoluble calcium carbonate precipitate alongside liquid water. This precise transformation mirrors standard acid-base reactions where an acidic oxide effectively functions as a neutralizer towards basic compounds.

**9.** (C) Copper(II) hydroxide ($Cu(OH)2$)
Copper(II) hydroxide is a chemical base capable of neutralizing acids, but it does not dissolve appreciably in water to yield a significant concentration of aqueous hydroxide ions. Consequently, it cannot be classified as an alkali, unlike highly soluble metallic hydroxides such as sodium, potassium, or barium hydroxides, which

dissolve readily to form strongly basic alkaline solutions.

**10.** (A) P-3, Q-4, R-2, S-1
Quicklime corresponds chemically to calcium oxide, whereas slaked lime represents calcium hydroxide produced through the hydration of quicklime. Milk of magnesia is the common name for an aqueous suspension of magnesium hydroxide used as an antacid, while caustic soda represents sodium hydroxide, a strong alkali extensively utilized in industrial manufacturing processes and chemical synthesis.

**11.** (D) Hydrogen ions and hydroxide ions
Salt formation during an acid-base neutralization reaction fundamentally hinges on the combination of hydrogen ions from the acid and hydroxide ions from the base. These oppositely charged species unite to form neutral water molecules, while the remaining spectator metal cations and acid anions remain in solution or combine to yield the corresponding chemical salt compound.

**12.** (C) I, II, and III only
Salts can be synthesized using multiple chemical pathways, including direct elemental synthesis, displacement reactions involving active metals with dilute acids, and neutralization between metal carbonates and acids. Thermal decomposition of stable metal oxides generally yields other oxides or elements rather than salts, making specific synthesis methods highly dependent on the stability and chemical reactivity of reactants.

**13.** (C) Replaceable hydroxide ions from the parent base
A basic salt is formed when a polyacidic base undergoes incomplete or partial neutralization by an acid, leaving behind unreacted hydroxide groups in its chemical structure. These lingering hydroxide ions can be further neutralized by additional acid, distinguishing basic salts from normal salts that lack any replaceable hydrogen or hydroxide ions in their chemical formulas.

**14.** (D) Sodium hydrogen sulfate ($NaHSO_4$)
An acidic salt contains replaceable hydrogen atoms derived from the partial neutralization of a polyprotic acid by a base. Sodium hydrogen sulfate contains an unreplaced hydrogen ion in its chemical formula, allowing it to dissociate in water and release hydronium ions, thereby exhibiting acidic properties and lowering the pH of the resulting solution.

**15.** (A) Hydrogen
Alkali metals such as sodium react vigorously with water in an exothermic process that produces sodium hydroxide and releases hydrogen gas. The liberated hydrogen gas is highly flammable and often ignites due to the intense heat generated during the reaction, while the formation of dissolved hydroxide ions renders the surrounding solution strongly alkaline in character.

**16.** (B) A proton
The Bronsted-Lowry theory of acids and bases defines acid-base reactions fundamentally through the transfer of a proton, or hydrogen ion, from one species to another. Under this theoretical framework, an acid functions as a proton donor that releases hydrogen ions, while a base acts as a proton acceptor that chemically binds the transferred hydrogen ion.

**17.** (D) As an electron-pair acceptor
According to the Lewis acid-base theory, an acid is broadly defined as any atom, ion, or molecule that can accept an electron pair to form a coordinate covalent bond. This definition extends acidic behavior beyond proton transfer, encompassing electron-deficient species with vacant atomic orbitals that actively accept non-bonding electron pairs provided by electron-dense donor molecules.

**18.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Boron trifluoride functions as a classical Lewis acid despite containing no hydrogen atoms because the central boron atom possesses only six valence electrons, leaving an incomplete octet. This electron deficiency creates an empty atomic orbital capable of accepting a lone pair of electrons from a donor molecule, perfectly explaining its acidic behavior under Lewis chemical theory.

**19.** (C) $H_2O$
A conjugate base is formed when a Bronsted-Lowry acid loses a single proton during a chemical reaction. When the hydronium ion donates a proton, it transforms into a neutral water molecule. Consequently, water serves as the conjugate base of the hydronium ion in

Downloaded from www.pdf.tube

(B) P-4, Q-3, R-2, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-2, Q-4, R-1, S-3

**131.** A salt derived from the neutralization of a strong acid and a strong base (like KBr) does not alter the pH of water primarily because:
(A) Its constituent cations and anions immediately combine to form dense, highly insoluble aqueous precipitates.
(B) It is chemically inert and completely fails to dissolve or dissociate when placed in pure distilled water.
(C) Neither constituent ion undergoes hydrolysis in water.
(D) It completely dissociates into non-ionic neutral metallic and non-metallic atoms upon entering aqueous solution.

**132.** The term "water of crystallization" refers precisely to:
(A) The exact minimum volume of pure water required to completely dissolve one full mole of an ionic crystalline salt.
(B) The fixed water molecules bound in a salt's crystal lattice.
(C) The liquid water molecules formed as a secondary chemical byproduct during an acid-base neutralization reaction.
(D) The atmospheric moisture spontaneously absorbed by a solid hygroscopic substance when left exposed to ambient air.

**133.** Copper(II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) is a widely known crystalline salt. What is its striking visual characteristic?
(A) It is a brilliant white powder.
(B) It forms deep blue crystals.
(C) It exists as a pale green solid.
(D) It is an entirely colorless, transparent crystal.

**134.** Plaster of Paris, a vital material in medicine and construction, is manufactured by carefully heating gypsum ($CaSO_4 \cdot 2H_2O$) to a specific temperature (373 K). What is the chemical formula of the resulting Plaster of Paris?
(A) $CaSO_4$
(B) $CaSO_4 \cdot 1/2H_2O$
(C) $CaSO_4 \cdot H_2O$
(D) $CaSO_4 \cdot 3H_2O$

**135.** Which of the following common domestic salts does NOT naturally possess water of crystallization in its standard solid state?
(A) Baking soda (Sodium bicarbonate)
(B) Washing soda decahydrate (Sodium carbonate)
(C) Epsom salt (Magnesium sulfate)
(D) Gypsum mineral salt (Calcium sulfate)

NODIA

**136.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** When clear crystals of washing soda ($Na_2CO_3 \cdot 10H_2O$) are left exposed to dry air, they gradually turn into a white, opaque powder.
**Reason (R):** Washing soda exhibits efflorescence, spontaneously losing nine molecules of its water of crystallization to the atmosphere.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**137.** Baking powder is a chemical mixture used in baking. What two primary components must it contain to function properly when moistened?
(A) Highly alkaline sodium carbonate combined with strong sodium hydroxide solution.
(B) Sodium bicarbonate and a mild edible acid like tartaric acid.
(C) Neutral sodium chloride mixed thoroughly with solid ammonium chloride powder.
(D) Insoluble calcium carbonate mixed with concentrated organic citric acid crystals.

**138.** A stubborn yellow turmeric stain on a white cotton cloth turns deep reddish-brown when scrubbed with common bar soap. What chemical principle explains this?
(A) Turmeric is a natural indicator that turns red in basic soap.
(B) Soap acts as an aggressive strong acid that directly oxidizes the yellow turmeric pigment upon scrubbing.
(C) The turmeric stain undergoes a rapid chemical combustion reaction facilitated by surfactant molecules in the soap.
(D) Turmeric pigments rapidly precipitate out as an insoluble bright red complex salt when reacting with sodium ions.

**139.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
**Assertion (A):** Opening a pressurized bottle of

solutions below pH 4.5 and blue in basic solutions above pH 8.3 during qualitative chemical testing.

**30.** (A) 3, 1, 2, 4
Gastric juice is extremely acidic with a pH between 1.5 and 2.0, followed by lemon juice which typically exhibits a pH around 2.2 to 2.4. Human blood is slightly basic with a pH near 7.4, whereas household cleaning ammonia is strongly basic with a pH exceeding 11, placing these substances in clear order of increasing pH values.

**31.** (D) Displays distinct color changes corresponding to different pH values.
A universal indicator consists of a mixture of several individual chemical indicators that undergo sequential color transitions across a broad pH spectrum from zero to fourteen. Unlike simple indicators that only signal acidic or basic thresholds, a universal indicator provides a continuous color range that allows precise visual estimation of specific pH values in test solutions.

**32.** (D) I, II, III, and IV
Olfactory indicators change their characteristic odor depending on whether they are present in acidic or basic solutions. Substances such as vanilla extract, clove oil, and onion lose their distinct smells in basic media while retaining them in acidic media, providing an effective visual-independent chemical testing mechanism particularly useful for visually impaired individuals conducting acid-base analysis.

**33.** (C) Methyl orange
Methyl orange is a synthetic chemical indicator manufactured in laboratory settings through organic chemical synthesis. In contrast, red cabbage extract, turmeric powder, and litmus dye are naturally derived indicators extracted directly from plant sources or biological organisms, rendering synthetic indicators fundamentally distinct in origin from natural botanical indicators used in chemical acid-base detection.

**34.** (D) The degree of its dissociation into ions.
The fundamental distinction between strong and weak acids lies in their degree of ionization in aqueous solution. A strong acid completely dissociates into hydrogen ions and conjugate base anions in water, whereas a weak acid undergoes only partial ionization, establishing a dynamic chemical equilibrium between un-ionized acid molecules and released ions within the aqueous medium.

**35.** (C) Less than 1, meaning it partially ionizes.
The degree of dissociation represents the fraction of total solute molecules that convert into ions in solution. For a weak monobasic acid, ionization is incomplete due to a strong chemical equilibrium favoring the intact molecule, resulting in a degree of dissociation strictly less than one, which directly accounts for its low hydronium ion concentration in water.

**36.** (D) Ammonium hydroxide
Ammonium hydroxide is classified as a weak base because it ionizes only partially in aqueous solution, establishing an equilibrium that yields a relatively low concentration of hydroxide ions. Conversely, sodium hydroxide, potassium hydroxide, and barium hydroxide are strong bases that dissociate almost completely into metallic cations and hydroxide ions when dissolved in water.

**37.** (C) Hydrochloric acid
Electrical conductivity in aqueous solutions depends directly on the concentration of mobile ions available to transport charge. Hydrochloric acid is a strong mineral acid that ionizes completely in water, producing a significantly higher concentration of free hydronium and chloride ions than weak organic acids like acetic, formic, or carbonic acid at identical molar concentrations.

**38.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Electrolytic conductivity relies on the concentration of free ions in solution. Acetic acid is a weak monobasic acid that ionizes only partially, producing relatively few free ions. In contrast, sulfuric acid is a strong diprotic acid that dissociates completely, yielding a much higher ion density and resulting in significantly superior electrical conductivity at equal molarities.

**39.** (B) Strong bases fully ionize in solution, whereas weak bases ionize partially.
Strong and weak bases are distinguished by their relative extent of ionization in water. Strong bases dissociate completely into hydroxide ions and metallic cations upon dissolution, whereas

Click Here to Buy book on Flipkart

weak bases undergo incomplete ionization, maintaining a dynamic equilibrium between intact basic molecules and aqueous ions, which results in lower hydroxide concentrations at equivalent total molarities.

**40.** (A) P-4, Q-1, R-3, S-2
Stomach acidity is neutralized using antacids containing milk of magnesia, while agricultural soil acidity is corrected using slaked lime. Bee stings inject acidic venom neutralized by basic baking soda paste, whereas wasp stings deliver alkaline venom that is effectively counteracted by applying mild organic acids such as household vinegar to the affected skin surface.

**41.** (C) -13.7 kcal/mol (-57.1 kJ/mol)
The standard enthalpy of neutralization for a strong acid reacting with a strong base in dilute aqueous solution is constant because the net chemical reaction simply involves the combination of hydrogen ions and hydroxide ions to form water. This exothermic chemical combination releases approximately 57.1 kilojoules per mole, corresponding to negative 13.7 kilocalories per mole.

**42.** (A) Magnesium hydroxide
Magnesium hydroxide is an insoluble, mild basic compound widely utilized as the active component in commercial antacid preparations. When ingested, it reacts gently with excess hydrochloric acid in gastric juice to form magnesium chloride salt and neutral water, effectively raising stomach pH and alleviating hyperacidity without causing tissue irritation or systemic alkalosis.

**43.** (C) Bee stings are acidic and neutralized by baking soda, while wasp stings are alkaline.
Bee venom contains formic acid and other acidic compounds, making basic baking soda paste an effective neutralizing agent that relieves localized pain and inflammation. Conversely, wasp venom is inherently alkaline in chemical nature, requiring mild acidic substances like vinegar rather than basic formulations to neutralize the sting site and alleviate irritation successfully.

**44.** (D) $H+(aq) + OH-(aq) \rightarrow H_2O(l)$
In aqueous titrations involving strong acids and strong bases, the constituent mineral anions and alkali metal cations act as non-reacting spectator ions. Consequently, the overarching net ionic equation that accurately describes all strong acid and strong base neutralizations reduces strictly to hydrogen ions combining with hydroxide ions to synthesize liquid water molecules.

**45.** (C) Sulfuric acid ($H_2SO_4$)
Sulfuric acid is widely designated as the "King of Chemicals" in industrial contexts because its global production volume and consumption serve as key indicators of a nation's industrial capacity. It plays an indispensable chemical role in manufacturing fertilizers, synthetic detergents, explosives, petroleum products, dyes, and storage batteries across numerous global industrial sectors.

**46.** (B) II only
Nitric acid is a potent oxidizing agent that oxidizes hydrogen to water during metal reactions and serves as a vital reagent in synthesizing trinitrotoluene. However, nitric acid is manufactured industrially via the Ostwald process involving catalytic oxidation of ammonia, whereas the Contact process is used exclusively for the large-scale industrial manufacture of sulfuric acid.

NODIA

**47.** (D) 3 parts concentrated HCl and 1 part concentrated $HNO_3$
Aqua regia is a fuming corrosive liquid prepared fresh by mixing three parts concentrated hydrochloric acid with one part concentrated nitric acid by volume. The reaction generates nitrosyl chloride and free chlorine, enabling this powerful acid mixture to dissolve resistant noble metals such as gold and platinum by forming soluble chlorometallate complex ions.

**48.** (A) Sulfuric acid
Lead-acid batteries utilized in automotive applications rely on an aqueous solution of sulfuric acid at approximately thirty-eight percent concentration as their primary liquid electrolyte. Sulfuric acid provides free hydrogen and sulfate ions that participate directly in reversible electrochemical reduction and oxidation reactions occurring at the lead dioxide and metallic lead battery electrodes during operation.

**49.** (C) Production of ammonium nitrate fertilizers
Hydrochloric acid is extensively used for pickling steel to remove surface oxides, manufacturing polyvinyl chloride precursor chemicals, and

descaling industrial boilers. However, ammonium nitrate fertilizer is synthesized exclusively through the neutralization reaction between ammonia and nitric acid, rendering hydrochloric acid irrelevant to the commercial production of ammonium nitrate agricultural fertilizers.

**50.** (D) Nitric acid
The Ostwald process is the primary industrial method used worldwide for synthesizing nitric acid. It involves the catalytic oxidation of anhydrous ammonia to nitric oxide over a platinum-rhodium catalyst at elevated temperatures, followed by further oxidation to nitrogen dioxide and subsequent absorption in water to produce high-concentration industrial nitric acid solutions efficiently.

**51.** (D) Caustic potash
Potassium hydroxide is commercially known as caustic potash due to its highly corrosive, caustic action on organic tissues and its historical derivation from wood ash extracts. It is a strong, deliquescent basic compound widely utilized in chemical manufacturing, soft soap production, alkaline battery construction, and industrial synthesis as a strong nucleophilic alkaline reagent.

**52.** (A) I, II, and IV only
Sodium hydroxide is a major chemical commodity vital for soap manufacturing, alumina extraction from bauxite via the Bayer process, and paper pulp processing. However, due to its highly caustic nature, sodium hydroxide is never used directly as a food preservative, as strong basic chemicals cause severe chemical burns and destroy organic food tissue upon contact.

**53.** (B) Sodium hydroxide, chlorine gas, and hydrogen gas
The industrial electrolysis of concentrated aqueous sodium chloride solutions, known as the chlor-alkali process, yields three primary commercial chemical products. Chlorine gas is liberated at the anode, hydrogen gas is evolved at the cathode, and sodium hydroxide accumulates in the surrounding aqueous solution, providing foundational raw materials for diverse chemical manufacturing industries worldwide.

**54.** (B) Is a weak aqueous base that readily decomposes upon heating.
Ammonium hydroxide exists only as an aqueous solution formed by dissolving gaseous ammonia in water. Unlike fixed alkali metal hydroxides, ammonium hydroxide is a weak base that establishes a dynamic equilibrium and readily decomposes upon mild heating, liberating volatile ammonia gas and leaving behind pure water as the dissolved gas escapes from solution.

**55.** (D) Potassium hydroxide
The saponification of fats and vegetable oils using potassium hydroxide produces potassium salts of long-chain fatty acids, which are significantly more soluble in water than sodium salts. Consequently, potassium hydroxide is specifically selected for manufacturing soft liquid soaps and shaving creams, whereas sodium hydroxide yields hard solid bar soaps upon chemical saponification.

**56.** (B) Aluminum hydroxide
Aluminum hydroxide is a metallic hydroxide that exhibits extremely low solubility in water and acts as a weak, amphoteric compound rather than a strong base. Conversely, alkali metal hydroxides like lithium and sodium hydroxide, along with heavier alkaline earth hydroxides such as barium hydroxide, dissolve significantly in water to produce strongly basic solutions.

**57.** (D) Acidic salt
Polyprotic acids possess multiple ionizable hydrogen atoms per molecule. When such an acid undergoes incomplete neutralization with a base, not all acidic hydrogens are replaced by metallic cations. The resulting compound retains ionizable protons in its structure, classifying it as an acidic salt capable of further neutralizing basic hydroxides in secondary reactions.

**58.** (C) Assertion (A) is true but Reason (R) is false.
Sodium carbonate turns red litmus paper blue because its aqueous solution is basic due to salt hydrolysis. However, sodium carbonate is derived from a strong base and a weak acid, meaning its carbonate anions undergo hydrolysis to generate excess hydroxide ions, rendering the salt solution basic rather than acidic as claimed in the statement.

NODIA

toxicity, making it an entirely unacceptable agricultural management practice.

**98.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Sodic soils in arid regions suffer from high exchangeable sodium levels that cause soil clay particles to disperse, destroying soil structure. Applying agricultural gypsum introduces soluble calcium ions, which displace exchangeable sodium from the clay complex. This ion exchange promotes soil flocculation, restores structural stability, and allows sodium leaching during field irrigation.

**99.** (D) Bicarbonates of calcium and magnesium
Temporary water hardness is caused specifically by dissolved calcium bicarbonate and magnesium bicarbonate. These soluble salts are formed when rainwater containing dissolved carbon dioxide percolates through limestone or dolomite rocks. Temporary hardness is easily removed by boiling, which thermally decomposes soluble bicarbonates into insoluble calcium and magnesium carbonates that precipitate out of solution.

**100.** (A) P-3, Q-4, R-1, S-2
Boiling removes temporary hardness by thermally decomposing soluble bicarbonates into insoluble carbonates. Clark's method uses lime to precipitate calcium carbonate. Calgon's method sequester hardness ions by forming soluble sodium hexametaphosphate complexes, while synthetic ion-exchange resins exchange calcium and magnesium ions for sodium or hydrogen ions using poly-functional polymer matrices.

**101.** (A) Calcium sulfate and magnesium chloride
Permanent water hardness cannot be removed by simple boiling because it is caused by dissolved sulfate and chloride salts of calcium and magnesium, such as calcium sulfate and magnesium chloride. These salts remain fully soluble upon heating, requiring chemical treatments like washing soda, Calgon, or ion-exchange resins to remove divalent metallic ions from solution.

**102.** (B) Calcium carbonate
When water containing temporary hardness is heated, soluble calcium bicarbonate undergoes thermal decomposition into water, carbon dioxide gas, and solid calcium carbonate. Because calcium carbonate has extremely low solubility in hot water, it precipitates out as a dense white mineral scale on the inner surfaces of kettles, boilers, and hot water pipes.

**103.** (C) Sodium hexametaphosphate
Calgon is the commercial trade name for sodium hexametaphosphate. In water treatment, it acts as a sequestering agent by reacting with dissolved calcium and magnesium cations to form stable, soluble coordination complexes. This prevents these hard water ions from reacting with soap or forming insoluble scale deposits without requiring physical filtration of solids.

**104.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Synthetic ion-exchange resins yield completely demineralized water through a sequential two-step process. The cation-exchange resin swaps all dissolved metallic cations for hydrogen ions, while the anion-exchange resin replaces all inorganic anions with hydroxide ions. The released hydrogen and hydroxide ions instantly combine to form pure water, producing high-purity deionized chemical water throughout the process.

**105.** (D) The equivalence point
In volumetric acid-base titrations, the equivalence point represents the precise theoretical stage where the chemical equivalents of added titrant exactly equal the chemical equivalents of analyte present in the sample. This stoichiometry contrasts with the indicator end point, which is the experimental point marked by an observable visual color change in solution.

**106.** (D) I, II, and III
Indicator selection depends on matching its pH color-change range with the steep vertical region of the titration curve. Phenolphthalein works for strong acid-strong base and weak acid-strong base titrations due to basic equivalence points. Methyl orange operates in acidic pH ranges, making it ideal for strong acid-weak base titrations, rendering all three statements accurate.

**107.** (D) A solution of precisely known concentration used as a reference titrant.
A standard solution is chemically defined as a reagent solution whose concentration is precisely known and accurately verified beforehand.

Downloaded from www.pdf.tube

the temperature at which water freezes below zero degrees Celsius, thereby melting existing ice quickly and preventing hazardous road refreezing under sub-zero winter weather conditions everywhere.

**69.** (B) Calcium hydroxide
Calcium hydroxide is classified as a strong base because the portion that dissolves in water dissociates almost completely into calcium and hydroxide ions. However, its overall solubility in water is quite limited at ambient temperatures, making it a classic example of a strong base that is simultaneously sparingly soluble in aqueous systems.

**70.** (A) P-3, Q-2, R-1, S-4
When the ionic product is less than the solubility product, the solution remains unsaturated without precipitation. When equal, the solution reaches saturation equilibrium. If the ionic product exceeds the solubility product, precipitation occurs immediately to restore equilibrium, while introducing a common ion depresses salt solubility in accordance with Le Chatelier's equilibrium principle.

**71.** (D) They are highly soluble in water, forming strong alkalis.
Alkali metal hydroxides, such as sodium and potassium hydroxide, are characterized by high water solubility and complete dissociation into ions, making them strong alkalis. In contrast, transition metal hydroxides generally exhibit extremely low solubility in water, often precipitating out of solution as insoluble hydroxides during precipitation reactions involving aqueous metallic ions.

**72.** (C) IV only
Alkali metal, ammonium, nitrate, and acetate salts are universally soluble, as are most chlorides except those of silver, lead, and mercury. However, statement four is incorrect because most metallic carbonates are completely insoluble in water, with only alkali metal carbonates and ammonium carbonate exhibiting significant water solubility under ambient conditions.

**73.** (C) Silver chloride (AgCl)
Silver chloride is a classic sparingly soluble salt with an extremely small solubility product constant in water at room temperature. In contrast, common alkali metal salts like potassium sulfate and sodium nitrate, along with ammonium chloride, undergo extensive dissolution in water to yield highly concentrated ionic solutions due to favorable lattice and hydration energies.

**74.** (D) AgCl precipitates out due to the common ion effect.
Introducing concentrated sodium chloride to a saturated silver chloride solution increases the concentration of chloride ions in solution. In accordance with the common ion effect and Le Chatelier's principle, this excess common ion shifts the dissolution equilibrium to favor the reverse reaction, causing additional silver chloride to precipitate out of the liquid phase.

**75.** (D) Citric acid
Citric acid is a weak organic tricarboxylic acid naturally present in significant concentrations within citrus fruits such as lemons, limes, oranges, and grapefruits. It is primarily responsible for the characteristic sharp sour taste of these fruits, playing an important biological role in the citric acid cycle during cellular respiration across aerobic organisms.

**76.** (A) Acetic acid
Commercial vinegar is an aqueous solution containing approximately four to eight percent acetic acid by volume, produced through the two-step fermentation of ethanol by acetic acid bacteria. The presence of acetic acid imparts the characteristic pungent aroma and sour flavor to vinegar, while providing natural antimicrobial properties that prevent food spoilage during culinary preservation.

**77.** (C) Methanoic acid
The painful stinging sensation and sharp localized inflammation resulting from ant bites or contact with nettle plant hairs are caused by the injection of methanoic acid, commonly called formic acid. This simple carboxylic acid disrupts cellular chemistry upon injection, but can be neutralized by applying mild basic substances such as baking soda to the skin.

NODIA

**78.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Common household soaps consist of sodium or potassium salts of long-chain fatty acids, which act as weak organic acids. When dissolved in water, the fatty acid anions undergo salt

**118.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Pickling is a vital metallurgical process used to clean steel surfaces before coating, galvanizing, or plating. Steel components are immersed in dilute sulfuric or hydrochloric acid solutions, which chemically dissolve surface iron oxides and rust scale, leaving behind a clean metallic substrate necessary for optimal adhesion of protective coatings.

**119.** (A) Nitrogen fertilizers and industrial explosives
Nitric acid is an essential precursor in both agricultural and defense manufacturing industries. Neutralizing nitric acid with ammonia yields ammonium nitrate, a widely used high-nitrogen agricultural fertilizer. Additionally, nitric acid serves as a primary nitrating agent in synthesizing military and commercial energetic compounds, including trinitrotoluene and nitroglycerin explosives.

**120.** (A) Sulfuric acid > Nitric acid > Hydrochloric acid
Sulfuric acid leads worldwide chemical production volume by a wide margin due to its massive application in fertilizer manufacturing and industrial processes. Nitric acid ranks second among mineral acids, driven primarily by high demand for nitrogenous agricultural fertilizers, while hydrochloric acid produced commercially occupies third position in global industrial production scale.

**121.** (B) Synthesis of nitrogenous fertilizers
Ammonia produced via the Haber-Bosch process is a foundational inorganic weak base. Its largest single industrial application is the synthesis of nitrogenous fertilizers, including urea, ammonium nitrate, ammonium sulfate, and diammonium phosphate, which together supply essential soil nitrogen required to sustain global agricultural crop yields and food production.

**122.** (A) Slowly add acid to water with constant stirring.
Diluting concentrated sulfuric acid is a highly exothermic process that releases large amounts of heat energy. Water must never be added to concentrated acid because localized boiling can cause dangerous splashing of corrosive acid. The standard protocol requires adding acid slowly to water with continuous stirring to safely dissipate heat throughout the liquid.

**123.** (C) Neutralize the acid spill with solid sodium bicarbonate.
Managing a concentrated acid spill safely requires neutralisation using a mild basic solid such as sodium bicarbonate. Sodium bicarbonate reacts with spilled acid to form harmless salts, water, and carbon dioxide gas without generating violent heat or extreme chemical reactions, making it safe before sweeping up the residue and washing the area.

**124.** (C) Using mouth suction to draw liquids into a pipette.
Mouth pipetting is strictly prohibited in all chemical laboratories due to the severe risk of accidentally ingesting corrosive, toxic, or hazardous reagents. Modern safety standards mandate using mechanical pipette bulbs, pumps, or automated pipetting devices to draw liquid volumes safely, preventing chemical exposure, toxic vapor inhalation, and internal mucosal burns during fluid transfer.

**125.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Concentrated alkalis like sodium hydroxide slowly attack silicon dioxide present in laboratory glass bottles. This chemical reaction forms sodium silicate along ground-glass joints, causing glass stoppers to fuse or cement permanently into bottle necks. Consequently, alkaline solutions are stored in rubber-stoppered or specialized polyethylene containers to prevent etching and fusion.

**126.** (B) It blocks light to prevent photochemical decomposition into $NO_2$ gas.
Concentrated nitric acid undergoes photochemical decomposition when exposed to ambient light, breaking down into water, oxygen, and dissolved nitrogen dioxide gas. The accumulation of nitrogen dioxide imparts a yellow brown color to the acid. Amber glass bottles absorb actinic light wavelengths, preventing light-induced decomposition and preserving reagent purity over time.

**127.** (B) Neutralization
Salt hydrolysis is defined conceptually as the reverse process of acid-base neutralization. During neutralization, an acid reacts with a base to form a salt and water. Conversely, during salt hydrolysis, dissolved salt ions react with water molecules, splitting water into hydrogen or

Click Here to Buy book on Amazon

**88.** (A) Pepsin
Parietal cells in the human stomach lining secrete hydrochloric acid, lowering gastric pH to approximately 1.5 to 2.0. This intense acidic environment is required to cleave inactive pepsinogen into its active proteolytic enzyme form, pepsin. Pepsin then efficiently hydrolyzes dietary proteins into smaller peptide chains while simultaneously destroying ingested harmful microorganisms.

**89.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Tooth enamel is composed predominantly of calcium hydroxyapatite, a crystalline calcium phosphate mineral. When bacteria in the mouth ferment dietary carbohydrates, they produce organic acids that lower oral pH. Below pH 5.5, the local environment becomes acidic enough to dissolve calcium hydroxyapatite, causing mineral demineralization and initiating progressive dental decay.

**90.** (C) The carbonic acid/bicarbonate system
The carbonic acid/bicarbonate buffer system serves as the principal chemical buffer maintaining blood plasma pH within its narrow physiological range. Dissolved carbon dioxide forms weak carbonic acid, which exists in equilibrium with bicarbonate ions. This dynamic buffer system rapidly neutralizes excess metabolic acids or bases, while respiratory and renal mechanisms adjust carbon dioxide and bicarbonate levels continuously.

**91.** (D) Lactic acid
During strenuous physical exercise, oxygen delivery to skeletal muscles may fall short of metabolic demand, shifting cellular respiration to anaerobic glycolysis. This pathway produces lactic acid, which dissociates into lactate and hydrogen ions. The accumulation of hydrogen ions lowers intramuscular pH, impairing enzyme activity and muscle contraction mechanics, ultimately causing localized muscle fatigue and painful cramps.

**92.** (A) I, II, and III only
Systemic acid-base homeostasis relies on chemical blood buffers for instant defense, respiratory control of carbon dioxide exhalation for rapid adjustments, and renal excretion or reabsorption of hydrogen and bicarbonate ions for long-term regulation. The liver processes metabolites but does not sequester hydrochloric acid to control blood pH, making statement four biologically incorrect.

**93.** (C) 6.5 to 7.5
Most agricultural crops thrive best in near-neutral soils with a pH between 6.5 and 7.5. Within this optimal pH range, key plant nutrients such as nitrogen, phosphorus, potassium, calcium, and magnesium achieve maximum solubility and bio-availability for root absorption, while toxic heavy metal concentrations remain low, ensuring robust plant growth and high crop yields.

**94.** (D) Quicklime or slaked lime
Excessively acidic soils restrict crop growth by reducing nutrient availability and increasing toxic aluminum solubility. To neutralize soil acidity, farmers apply basic calcium compounds such as quicklime or slaked lime. These basic materials react with active hydrogen ions in soil moisture, effectively raising soil pH to a level suitable for optimal crop cultivation and root development.

**95.** (A) Agricultural gypsum
Alkaline sodic soils contain excessive sodium ions bonded to soil clay particles, causing poor soil structure and high pH. Applying agricultural gypsum supplies soluble calcium ions that displace sodium from clay surfaces. The displaced sodium forms soluble sodium sulfate, which leaches away during irrigation, reducing soil alkalinity and improving aeration and water infiltration for crops.

NODIA

**96.** (B) Acidic soil
Hydrangea macrophylla plants produce vivid blue flowers when grown in acidic soils containing free soluble aluminum ions. Under acidic conditions, the plant absorbs dissolved aluminum, which combines with anthocyanin pigments in the petals to yield a blue color. In neutral or basic soils, aluminum becomes insoluble, causing the same plant to bloom pink instead.

**97.** (C) Flushing fields with concentrated sulfuric acid to lower soil pH rapidly.
Applying elemental sulfur or agricultural lime represent safe, standard methods for gradually adjusting soil pH. In contrast, flushing fields with concentrated sulfuric acid is extremely dangerous and destructive. It sterilizes soil microbiomes, destroys root structures, corrodes farming equipment, and causes severe environmental

carbon dioxide gas bubbles that expand the dough, giving baked goods light textures.

**138.** (A) Turmeric is a natural indicator that turns red in basic soap.
Turmeric contains curcumin, a natural polyphenol pigment that functions as an effective acid-base indicator. Under acidic or neutral conditions, curcumin remains bright yellow. However, when exposed to basic substances like household soap, curcumin undergoes structural ionization, resulting in a distinct visual shift from yellow to deep reddish-brown on fabric surfaces.

**139.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Carbonated beverages are bottled under high carbon dioxide pressure to force gas into aqueous solution as carbonic acid. Opening the bottle rapidly drops internal pressure, decreasing carbon dioxide gas solubility in accordance with Henry's law. This pressure drop causes dissolved carbonic acid to decompose into water and gaseous carbon dioxide effervescence.

**140.** (A) 2, 1, 4, 3
Testing soil pH begins by mixing the soil sample thoroughly with distilled water in a beaker to extract soluble ions. Next, the resulting suspension is filtered to yield a clear liquid extract. A strip of universal indicator paper is then dipped into the extract, and the resulting color change is compared against a standard chart.

www.nodia.in

Downloaded from www.pdf.tube

In quantitative volumetric analysis, standard solutions act as critical references, where measured volumes are reacted with target analyte solutions of unknown concentration to determine analyte molarity accurately through defined chemical reaction stoichiometry.

**108.** (A) Less than 7.0
Titrating a weak base with a strong acid yields a salt whose conjugate acid undergoes hydrolysis at the equivalence point. The accumulation of cationic conjugate acid species generates hydronium ions in aqueous solution, resulting in an equivalence point pH that is strictly acidic and lower than 7.0 at standard room temperature.

**109.** (C) Sodium hydroxide (NaOH)
Primary standards must possess high chemical purity, atmospheric stability, and precise molecular weight. Sodium hydroxide is unsuitable as a primary standard because it is highly hygroscopic, rapidly absorbing atmospheric moisture, and readily reacts with ambient carbon dioxide to form sodium carbonate, preventing the preparation of solutions with accurate, stable molarities directly by weight.

**110.** (C) 0.1 M
The neutralization reaction between sodium hydroxide and hydrochloric acid follows a one-to-one molar stoichiometry. Using the volumetric titration formula, multiplying the base volume of twenty-five milliliters by its 0.2 molarity equals fifty milliliters of acid multiplied by its unknown molarity, yielding a calculated hydrochloric acid concentration of exactly 0.1 M.

**111.** (C) An oxide that reacts with both acids and bases to produce salt and water.
An amphoteric oxide is defined as a metallic oxide that exhibits both acidic and basic chemical properties. Consequently, it reacts with strong acids as a basic oxide and with strong bases as an acidic oxide, yielding a salt and water in both instances, as demonstrated by the chemical reactions of zinc and aluminum oxides.

**112.** (A) I, II, and III
Zinc oxide, aluminum oxide, and lead(II) oxide are classic amphoteric oxides that react readily with both acids and bases. Magnesium oxide, however, is strictly a basic oxide that reacts exclusively with acids and shows no reactivity toward bases, meaning any group containing magnesium oxide includes an oxide that is not amphoteric in nature.

**113.** (B) Sodium aluminate
When aluminum oxide is heated with a concentrated aqueous solution of sodium hydroxide, it displays acidic behavior by reacting with the strong base. The reaction yields water and soluble sodium aluminate as the primary chemical product, demonstrating the amphoteric nature of aluminum oxide when exposed to strongly alkaline reaction conditions.

NODIA

**114.** (A) Sulfur trioxide ($SO_3$)
Sulfur trioxide is a non-metallic oxide that dissolves in water to form sulfuric acid and reacts exclusively with bases to yield sulfate salts, making it strictly an acidic oxide. Conversely, zinc oxide, tin(II) oxide, and beryllium oxide are amphoteric metallic oxides capable of reacting with both acids and strong basic alkalis.

**115.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Metalloids such as arsenic and antimony occupy intermediate positions on the periodic table between metals and non-metals, possessing intermediate electronegativity values. This dual electronic character allows their oxides to exhibit both acidic and basic chemical properties, enabling them to react with both strong acids and strong bases to form corresponding salts.

**116.** (C) Nitrogen - Acidic
Non-metal oxides generally exhibit acidic characteristics in water. Nitrogen forms non-metallic oxides such as nitrogen dioxide and dinitrogen pentoxide, which react with water to yield acidic solutions containing nitric and nitrous acids. Conversely, sodium and calcium form basic metallic oxides, while phosphorus forms acidic oxides rather than basic ones.

**117.** (B) Sulfuric acid
Sulfuric acid is consumed in vast global quantities for manufacturing phosphate fertilizers such as single superphosphate and ammonium phosphate. It is reacted with insoluble rock phosphate mineral to convert insoluble tricalcium phosphate into water-soluble monocalcium phosphate, producing a form easily absorbed by plant root systems to enhance agricultural productivity worldwide.

hydrolysis by abstracting protons from water molecules, generating free hydroxide ions that render the soap solution basic and turn indicator red litmus paper blue.

**79.** (D) Oxalic acid
Oxalic acid is a dicarboxylic acid extensively utilized in specialized cleaning formulations to remove rust and iron stains. It chemically reacts with insoluble ferric oxide rust to form a water-soluble iron-oxalate coordination complex, allowing stubborn rust marks to be easily rinsed away from clothing, fabrics, ceramics, and plumbing fixtures without damaging base materials.

**80.** (A) 1, 4, 2, 3
Tomato juice is acidic with a typical pH around 4.0 to 4.4, followed by human saliva before meals which is slightly acidic to near neutral around 6.5 to 6.8. Pure distilled water is neutral at pH 7.0, whereas commercial liquid bleach contains basic sodium hypochlorite with a pH exceeding 11, establishing the precise sequence of increasing pH.

**81.** (D) 5.6
Pure rainwater naturally absorbs atmospheric carbon dioxide to form weak carbonic acid, yielding a baseline pH of approximately 5.6. Consequently, environmental scientists classify atmospheric precipitation as acid rain only when its measured pH falls strictly below 5.6, indicating the addition of strong sulfur and nitrogen acids derived from industrial fossil fuel combustion pollution.

**82.** (A) Sulfur dioxide and nitrogen dioxide
Sulfur dioxide and nitrogen dioxide are the primary gaseous pollutants responsible for acid rain formation. Released during fossil fuel combustion, these gaseous non-metal oxides react with atmospheric oxygen and water vapor to form sulfuric acid and nitric acid, which fall to the Earth's surface within precipitation, causing widespread chemical degradation to aquatic and terrestrial ecosystems.

**83.** (C) Sulfuric acid
Marble cancer refers to the chemical degradation of historical structures composed of marble, which is fundamentally calcium carbonate. When airborne sulfuric acid from acid rain contacts marble, it reacts to form soluble calcium sulfate, carbon dioxide, and water. This reaction slowly dissolves and pits the stone surface, permanently eroding intricate architectural details on historic monuments.

**84.** (D) Depletion of the stratospheric ozone layer.
Acid rain causes severe environmental harm by leaching toxic aluminum into lakes, corroding metal and limestone structures, and stripping essential plant nutrients from forest soils. However, stratospheric ozone depletion is caused specifically by chlorofluorocarbons and halogenated ozone-depleting gases, which operate through entirely separate atmospheric photochemical mechanisms unrelated to tropospheric acid deposition.

**85.** (B) Wet deposition includes rain and snow, whereas dry deposition involves acidic gases and settling particles.
Acid deposition occurs through both wet and dry environmental pathways. Wet deposition encompasses precipitation such as rain, snow, fog, and sleet containing dissolved acids. Dry deposition refers to the direct gravitational settling or adsorption of airborne acidic gases, aerosols, and fine particulate matter onto vegetation, soil, water surfaces, and man-made structures during dry weather conditions.

**86.** (A) I only
Acid rain significantly lowers the pH of freshwater lakes, making them overly acidic and threatening sensitive aquatic organisms. Statement one is therefore incorrect because acid rain decreases rather than increases water pH. Meanwhile, acid rain damages protective plant leaf cuticles and leaches crucial nutrient cations like calcium and magnesium from forest soils, reducing overall agricultural and forest productivity.

**87.** (D) 7.35 to 7.45
Human arterial blood is maintained within a remarkably narrow physiological pH window between 7.35 and 7.45 to ensure optimal enzyme function and cellular metabolic stability. Deviations below 7.35 result in clinical acidosis, whereas values above 7.45 cause alkalosis, both of which severely disrupt physiological processes and compromise vital organ function if left uncorrected.

Click Here to Buy book on Flipkart

hydroxide ions and regenerating small amounts of parent acid or base.

**128.** (C) Acidic, due to the hydrolysis of the ammonium ion.
Ammonium chloride is a salt formed from a weak base and a strong acid. When dissolved in water, the ammonium ion undergoes cation hydrolysis, donating a proton to water to form hydronium ions and un-ionized ammonia. This release of excess hydronium ions lowers the pH, rendering the solution distinctly acidic.

**129.** (D) Greater than 7.0
Sodium acetate is derived from a weak organic acid and a strong inorganic base. In aqueous solution, acetate anions undergo anion hydrolysis by abstracting protons from water molecules to regenerate acetic acid, liberating free hydroxide ions in the process. This accumulation of hydroxide ions increases solution pH above 7.0 at room temperature.

**130.** (A) P-4, Q-2, R-3, S-1
Sodium chloride does not hydrolyze, yielding a neutral pH 7 solution. Potassium cyanide contains weak acid anions that undergo basic anion hydrolysis. Copper sulfate contains weak base cations that undergo acidic cation hydrolysis, while ammonium acetate contains ions that both hydrolyze equally, keeping the final solution nearly neutral at pH 7.

**131.** (C) Neither constituent ion undergoes hydrolysis in water.
Salts formed from strong acids and strong bases, such as potassium bromide, dissociate completely in water into spectator ions. Because the constituent cations and anions are derived from strong electrolytes, neither ion interacts chemically with water molecules to disturb the equal concentrations of hydronium and hydroxide ions, maintaining a neutral pH of 7.0.

**132.** (B) The fixed water molecules bound in a salt's crystal lattice.
Water of crystallization refers to the fixed number of water molecules chemically incorporated into a salt's solid crystalline framework during crystallization from aqueous solution. These structural water molecules are bound in stoichiometric proportions, contributing directly to the salt's distinct crystal geometry, color, and lattice stability without rendering the solid compound wet.

**133.** (B) It forms deep blue crystals.
Copper(II) sulfate pentahydrate is a well-known crystalline compound characterized by a vivid deep blue color. The blue coloration arises from d-d electronic transitions in cupric ions coordinated to four water molecules within the crystal structure. Heating the salt drives off its water of crystallization, converting it into a white anhydrous powder.

**134.** (B) $CaSO_4 \cdot 1/2H_2O$
Heating gypsum mineral to carefully controlled temperatures around 373 Kelvin causes partial dehydration, driving off three-quarters of its structural water content. The resulting hemihydrate compound is Plaster of Paris, represented chemically as calcium sulfate hemihydrate. When mixed with water, it rehydrates to form hard, crystalline gypsum matrix used in casting and medical casts.

**135.** (A) Baking soda (Sodium bicarbonate)
Baking soda exists natively as an anhydrous crystalline solid lacking water of crystallization in its formal chemical structure under ambient conditions. In contrast, washing soda decahydrate, Epsom salt heptahydrate, and gypsum dihydrate all possess specific, chemically bound stoichiometric ratios of water molecules incorporated directly into their solid crystal lattice framework.

**136.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Washing soda decahydrate exhibits efflorescence, a property where crystalline hydrates lose water of crystallization when exposed to dry atmospheric air. The compound spontaneously releases nine of its ten water molecules to ambient air, transforming clear crystalline washing soda into an opaque white powder consisting primarily of sodium carbonate monohydrate.

**137.** (B) Sodium bicarbonate and a mild edible acid like tartaric acid.
Commercial baking powder is a dry leavening mixture consisting of sodium bicarbonate combined with a solid mild edible acid such as tartaric acid or acid salts. When moistened during batter preparation, these components react in an acid-base neutralization, releasing

Downloaded from www.pdf.tube

**59.** (C) Double salts yield simple ions in solution, whereas complex salts retain complex ions.
Double salts, such as Mohr's salt, dissociate completely into their individual constituent simple ions when dissolved in water, losing their crystal identity entirely. In contrast, complex salts maintain their distinct coordination complex ions intact in aqueous solution, keeping the central metal ion coordinate-bonded to ligands without releasing free metallic cations into water.

**60.** (A) Ammonium chloride, Sodium chloride, Sodium acetate, Sodium carbonate
Ammonium chloride is an acidic salt yielding a pH below 7 through cation hydrolysis. Sodium chloride is neutral with a pH near 7. Sodium acetate is a weakly basic salt of a weak acid and strong base, while sodium carbonate undergoes greater hydrolysis to form a strongly basic solution, establishing the clear order of increasing pH values.

**61.** (D) Basic copper carbonate
Basic copper carbonate is a classic basic salt that incorporates both carbonate anions and unreplaced hydroxide anions within its crystalline structure. This basic nature arises from incomplete neutralization during preparation, distinguishing basic salts from normal salts like calcium chloride or acidic salts containing replaceable hydrogen atoms such as potassium hydrogen carbonate in solid chemical form.

**62.** (B) Ammonium nitrate ($NH_4NO_3$) - Strong acid and Weak base
Ammonium nitrate is synthesized through the chemical neutralization of nitric acid, a strong mineral acid, with ammonium hydroxide, a weak base. Consequently, aqueous ammonium nitrate undergoes cation hydrolysis to yield an acidic solution with a pH below 7, accurately reflecting its derivation from a strong acid and a weak basic starting material.

**63.** (C) A concentrated aqueous solution of sodium chloride.
In chemical technology, brine is defined specifically as a saturated or highly concentrated aqueous solution of sodium chloride. Brine serves as a crucial raw material in industrial electrolysis processes, such as the chlor-alkali process, and in the Solvay process for manufacturing sodium carbonate, providing a major source of industrial sodium and chlorine compounds.

**64.** (D) Chlorine at the anode and Hydrogen at the cathode
During the industrial electrolysis of brine, chloride ions undergo oxidation at the positive anode to liberate chlorine gas. Concurrently, water molecules undergo reduction at the negative cathode in preference to sodium ions, releasing hydrogen gas while leaving behind hydroxide ions in solution, which combine with sodium cations to form concentrated sodium hydroxide.

**65.** (C) Plaster of Paris
Sodium chloride serves as the fundamental sodium source for manufacturing baking soda, washing soda, and chlorine for bleaching powder. Conversely, Plaster of Paris is manufactured exclusively through the thermal dehydration of naturally occurring gypsum rock, a calcium sulfate mineral, requiring no sodium chloride or sodium derivatives at any stage of its chemical synthesis.

NODIA

**66.** (D) I, II, and III
Sodium chloride provides indispensable sodium cations required for propagating electrical nerve impulses and maintaining physiological osmotic balance across cell membranes. Furthermore, chloride ions derived from dietary sodium chloride are selectively utilized by parietal cells in the gastric mucosa to synthesize hydrochloric acid, which is vital for proper enzymatic protein digestion in the stomach.

**67.** (B) Presence of entrapped earthly impurities and trace minerals.
Naturally occurring rock salt deposits formed through the evaporation of ancient inland seas often display a distinct brown or tan coloration. This visual appearance is caused primarily by the inclusion of insoluble clay, sand, iron oxides, and diverse mineral impurities trapped within the sodium chloride crystal lattice during ancient geological deposition processes over time.

**68.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Spreading sodium chloride on icy roads creates a concentrated aqueous salt solution on the frozen ice surface. This dissolved solute causes colligative freezing point depression, lowering

# CHAPTER 18
# Chemical Compounds in Everyday Use

**1.** Which of the following represents the correct chemical formula and common name for bleaching powder?
(A) Calcium chlorate, $Ca(ClO_3)_2$
(B) Calcium hypochlorite, $CaOCl_2$
(C) Calcium chloride, $CaCl_2$
(D) Calcium carbonate, $CaCO_3$

**2.** What is the fundamental chemical reaction utilized in the manufacturing of bleaching powder?
(A) Passing chlorine gas through an aqueous solution of quicklime
(B) Reacting calcium carbonate with hydrochloric acid
(C) Heating calcium chloride with oxygen
(D) Passing chlorine gas over dry slaked lime

**3.** Which of the following best describes the primary reason baking soda is used in the preparation of cakes and bread?
(A) It releases carbon dioxide gas upon heating, making the dough rise
(B) It acts as a preservative agent to increase overall product shelf life
(C) It provides a sweet flavor and neutralizes unwanted acidic byproducts
(D) It absorbs ambient moisture from the environment to keep food soft

**4.** What is the chemical nature of an aqueous solution of washing soda?
(A) Strongly acidic
(B) Weakly acidic
(C) Alkaline
(D) Neutral

**5.** How many molecules of water of crystallization are present in one formula unit of washing soda?
(A) 5
(B) 7
(C) 10
(D) 12

**6.** Identify the incorrect statement regarding Plaster of Paris.
(A) Its chemical formula is $CaSO_4.1/2H_2O$
(B) It is prepared by heating gypsum to exactly 373 K
(C) Heating it beyond 373 K forms anhydrous calcium sulfate, known as dead burnt plaster
(D) It absorbs moisture from the air to form baking soda

**7.** What is the chemical name of the principal product formed during the saponification of fats and oils?
(A) Synthetic alkyl benzene sulfonate surfactants
(B) Sodium or potassium salts of fatty acids
(C) Anhydrous sodium carbonate alkali compound
(D) High molecular weight polyethylene glycol

**8.** Select the correct sequence of stages in the industrial production of soap.
(A) Saponification → Separation of glycerin → Purification → Finishing
(B) Separation of glycerin → Saponification → Finishing → Purification
(C) Finishing → Saponification → Purification → Separation of glycerin
(D) Purification → Separation of glycerin → Finishing → Saponification

**9.** Which of the following is a byproduct of the saponification process that has significant commercial value?
(A) Ethanol
(B) Acetone
(C) Methanol
(D) Glycerol

**10.** Consider the following statements regarding synthetic detergents:
I. They are sodium salts of long-chain alkyl hydrogen sulfates or alkyl benzene sulfonates.
II. They form insoluble scum with calcium and magnesium ions present in hard water.
III. They can be formulated to work effectively even in slightly acidic solutions.
Which of the above statements is/are correct?
(A) I and II only
(B) I and III only

Click Here to Buy book on Amazon

(D) Fluorescent optical brighteners

**72.** During the setting of Plaster of Paris, a slight expansion in volume occurs. What is the practical advantage of this property?
(A) It significantly increases the structural porosity of the final cured plaster mass
(B) It completely prevents the growth of unwanted mold and fungi on the hardened surface
(C) It creates precise and sharp casts in moulds
(D) It renders the final hardened material flexible and highly resistant to all cracking

**73.** Which of the following statements best describes the chemical distinction between a typical soap and a synthetic anionic detergent?
(A) Soap possesses a sulfonate group, whereas a detergent possesses a carboxylate group
(B) Soap is derived from petrochemicals, whereas a detergent is derived from natural vegetable oils
(C) Soap functions exclusively in acidic media, whereas synthetic detergents work only in basic media
(D) Soap has a carboxylate group; detergent has a sulfate/sulfonate group

**74.** Which major safety standard is prescribed for workers handling concentrated sodium hydroxide in a Chlor-Alkali plant?
(A) Wearing full face shields, protective suits, and having safety showers on site
(B) Wearing standard everyday cotton clothing without any protective aprons or specialized gear
(C) Routine hand washing using dilute mineral acids to neutralize accidental alkali spills on skin
(D) Working exclusively in completely sealed, non-ventilated rooms to prevent chemical gas escape

**75.** Consider the following statements:
**Assertion (A):** Bleaching powder should be stored in opaque, airtight containers.
**Reason (R):** Bleaching powder is highly sensitive to light and moisture, which accelerate its decomposition.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**76.** In an emergency soda-acid fire extinguisher, which two chemicals are kept in separate compartments and mixed only when inverted or struck?
(A) Sodium carbonate and hydrochloric acid
(B) Sodium bicarbonate and sulfuric acid
(C) Calcium hydroxide and nitric acid
(D) Sodium chloride and acetic acid

**77.** Which of the following compounds is the active ingredient in most commercial liquid toilet bowl cleaners due to its ability to dissolve scale and rust?
(A) Hydrochloric acid
(B) Sodium hydroxide
(C) Sodium bicarbonate
(D) Calcium oxychloride

**78.** Glass cleaners typically contain which household chemical to cut through grease and evaporate quickly without leaving streaks?
(A) Saturated sodium chloride
(B) Concentrated sulfuric acid
(C) Dilute ammonium hydroxide
(D) Sodium tripolyphosphate

**79.** The term "Dead Burnt Plaster" refers to which chemical compound?
(A) Calcium sulfate dihydrate
(B) Calcium sulfate hemihydrate
(C) Calcium carbonate
(D) Anhydrous calcium sulfate

**80.** Consider the following statements about the Solvay process:
I. Ammonia is recovered and recycled in the process.
II. The process uses inexpensive raw materials like brine and limestone.
III. Potassium carbonate can also be efficiently produced by this exact process.
IV. The only major waste product is calcium chloride.
Which of the statements are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II and III only

**81.** Which common chemical compound is used as a primary ingredient in the manufacture of dry powder fire extinguishers?
(A) Inorganic sodium chloride salt

NODIA

**21.** What is the active bleaching agent released by bleaching powder when exposed to dilute acids or carbon dioxide in the air?
(A) Chlorine
(B) Oxygen
(C) Hypochlorous acid
(D) Calcium chloride

**22.** Baking powder is a mixture of baking soda and a mild edible acid. Which of the following acids is most commonly used for this purpose?
(A) Hydrochloric acid
(B) Sulfuric acid
(C) Acetic acid
(D) Tartaric acid

**23.** What is the function of the mild edible acid present in baking powder?
(A) It provides a distinctly tangy flavor and pleasant aroma to baked goods
(B) It neutralizes sodium carbonate formed on heating to prevent a bitter taste
(C) It acts as an effective food preservative to prevent unwanted microbial growth
(D) It rapidly accelerates the thermal decomposition of baking soda at room temperature

**24.** Which class of raw materials is primarily required for the industrial manufacture of soap?
(A) Petroleum derivatives
(B) Synthetic polymers and coal tar
(C) Animal fats and vegetable oils
(D) Silicates and phosphates

**25.** Match the compounds in List-I with their common applications in List-II.
**List I: (Compounds)**
P. Sodium bicarbonate
Q. Calcium oxychloride
R. Sodium carbonate
S. Calcium sulfate hemihydrate
**List II: (Applications)**
1. Disinfection of water
2. Fire extinguishers
3. Casting statues and toys
4. Removing permanent hardness of water
(A) P-4, Q-1, R-2, S-3
(B) P-2, Q-3, R-4, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-2, Q-1, R-4, S-3

**26.** Synthetic detergents can be classified based on the charge of their polar head. Which type is most commonly used in household dishwashing liquids?
(A) Anionic detergents
(B) Cationic detergents
(C) Non-ionic detergents
(D) Zwitterionic detergents

**27.** Cetyltrimethylammonium bromide is a well-known example of which class of detergents?
(A) Anionic detergents
(B) Cationic detergents
(C) Non-ionic detergents
(D) Biodegradable soaps

**28.** Arrange the following steps in the correct order for the Solvay process used in the manufacture of sodium carbonate:
I. Calcination of sodium bicarbonate
II. Saturation of brine with ammonia
III. Carbonation of ammoniated brine
IV. Filtration of sodium bicarbonate
(A) II, III, IV, I
(B) I, II, III, IV
(C) III, II, IV, I
(D) II, IV, III, I

**29.** The excessive use of detergents containing phosphates contributes to which major environmental problem?
(A) Eutrophication of water bodies
(B) Widespread occurrence of acid rain
(C) Depletion of the stratospheric ozone layer
(D) Severe salinization of agricultural soil

**30.** Consider the following statements regarding the control measures for water pollution caused by detergents:
I. Replacing branched-chain hydrocarbons with unbranched chains in detergent formulation.
II. Reducing or eliminating the use of phosphates as builders in detergents.
III. Increasing the proportion of cationic surfactants over anionic ones in all products.
Which combination of statements correctly represents effective control measures?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

**31.** Which of the following principles is most crucial for the safe storage of chemical compounds like bleaching powder?
(A) Store continuously in an open container

Downloaded from www.pdf.tube

**91.** A student takes some water in a beaker and adds a pinch of soap to it. Lather is formed easily. The water in the beaker must be:
(A) Hard water
(B) Soft water
(C) Mineral water with high calcium content
(D) Sea water

**92.** Identify the incorrect pair regarding the raw material and its major industrial product.
(A) Brine : Sodium hydroxide
(B) Animal fat : Synthetic detergents
(C) Limestone : Bleaching powder (via quicklime)
(D) Gypsum : Plaster of Paris

**93.** What is the approximate percentage of available chlorine in a good quality sample of commercial bleaching powder?
(A) 5-10%
(B) 15-20%
(C) 35-40%
(D) 70-75%

**94.** The structural formula of sodium stearate (a common soap) is:
(A) $C_{15}H_{31}COONa$
(B) $C_6H_5SO_3Na$
(C) $C_{17}H_{35}COONa$
(D) $CH_3COONa$

**95.** Consider the following statements:
**Assertion (A):** Hard water consumes a large amount of soap before any lather is formed.
**Reason (R):** The calcium and magnesium ions in hard water react with soap to form insoluble salts (scum) which possess no detergent properties.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**96.** Which compound is utilized in the textile industry specifically to neutralize the leftover chlorine after the bleaching process?
(A) Concentrated sodium carbonate solution
(B) Slaked calcium hydroxide suspension
(C) Sodium thiosulfate
(D) Hydrated plaster of Paris binder

**97.** The term "builder" in detergent formulations often refers to sodium tripolyphosphate. What is its main environmental drawback?
(A) It directly destroys the stratospheric ozone layer in the atmosphere
(B) It promotes algal growth, causing eutrophication
(C) It causes rapid chemical corrosion of internal washing machine components
(D) It thermally decomposes to generate highly toxic and lethal industrial gases

**98.** In which form is Plaster of Paris available in the market for medical and construction applications?
(A) Heavy liquid suspension
(B) Crystalline solid blocks
(C) Compressed tablets
(D) Fine white powder

**99.** Which of the following statements about baking soda is incorrect?
(A) It produces carbon monoxide gas upon baking
(B) Its official IUPAC chemical name is sodium hydrogen carbonate salt
(C) It serves as a primary functional constituent of commercial baking powder
(D) It is an essential active ingredient formulation in many stomach antacids

**100.** Consider the following chemical equations for industrial processes:
I. $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$
II. $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$
III. $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$
IV. $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + H_2O(l) + CO_2(g)$
Which of the above equations is/are correctly associated with the Solvay process and its subsequent heating step?
(A) I and II only
(B) III and IV only
(C) I, III and IV only
(D) II, III and IV only

**101.** During the saponification of an ester, what acts as the nucleophile?
(A) The hydroxide ion ($OH^-$)
(B) The fatty acid alkyl chain
(C) The sodium ion ($Na^+$)
(D) Water

**102.** What is the role of optical brighteners commonly added to modern laundry detergents?
(A) They chemically bleach textile fibers to

NODIA

(C) II, III and IV only
(D) I, III and IV only

**41.** Sodium carbonate is primarily manufactured industrially using which raw materials?
(A) Concentrated sodium hydroxide, elemental chlorine gas, and ammonia
(B) Anhydrous sodium sulfate, elemental carbon, and crushed limestone
(C) Aqueous calcium chloride, anhydrous ammonia, and carbon dioxide gas
(D) Sodium chloride, ammonia, and limestone

**42.** In the context of everyday chemicals, what is the chemical name of 'soda ash'?
(A) Anhydrous sodium carbonate
(B) Fully hydrated sodium carbonate decahydrate compound
(C) Sodium bicarbonate pharmaceutical antacid powder
(D) Highly caustic sodium hydroxide chemical base

**43.** Washing soda loses nine molecules of water of crystallization when exposed to dry air. What is this phenomenon called?
(A) Deliquescence
(B) Efflorescence
(C) Hygroscopy
(D) Sublimation

**44.** What is the characteristic odor associated with bleaching powder?
(A) Pungent odor of ammonia
(B) Strong smell of chlorine
(C) Rotten egg odor of hydrogen sulfide
(D) Sweet, fruity odor of esters

**45.** Match the everyday chemicals in List-I with their principal industrial manufacturing process in List-II.
**List I: (Everyday chemicals)**
P. Sodium hydroxide
Q. Sodium carbonate
R. Bleaching powder
S. Soap
**List II: (Manufacturing processes)**
1. Saponification
2. Chlor-alkali process
3. Action of chlorine on slaked lime
4. Solvay process
(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-3, R-4, S-1
(D) P-3, Q-4, R-2, S-1

**46.** The structural orientation of a soap molecule in a micelle is best described by which of the following?
(A) Hydrophilic heads point inwards and hydrophobic tails point outwards
(B) Both hydrophilic heads and hydrophobic tails are randomly distributed throughout
(C) Hydrophobic tails point inwards and hydrophilic heads point outwards
(D) Soap molecules remain in a straight line parallel to the water surface

**47.** Which substance is added to shaving soaps to prevent them from drying rapidly?
(A) Rosin
(B) Sodium chloride
(C) Sodium carbonate
(D) Glycerol

**48.** Select the correct sequence of events that occurs when soap cleans a grease stain.
(A) Formation of micelle → Entrapment of grease in micelle center → Hydrophobic tails attach to grease → Washing away with water
(B) Hydrophobic tails attach to grease → Formation of micelle → Entrapment of grease in micelle center → Washing away with water
(C) Washing away with water → Formation of micelle → Hydrophobic tails attach to grease → Entrapment of grease in micelle center
(D) Entrapment of grease in micelle center → Hydrophobic tails attach to grease → Formation of micelle → Washing away with water

**49.** What is the primary function of "builders" like sodium tripolyphosphate (STPP) in detergent formulations?
(A) To add pleasant artificial color, aesthetic appearance, and lasting fragrance
(B) To soften water by sequestering calcium and magnesium ions
(C) To act as a foaming agent
(D) To reduce the manufacturing cost without affecting performance

**50.** Consider the following statements about the environmental impact of detergents:
I. Eutrophication leads to an excessive growth of algae.

Click Here to Buy book on Flipkart

exposed to direct sunlight
(B) Mix thoroughly with strong acids prior to storage for chemical stabilization
(C) Keep completely dissolved in water inside a large sealed airtight storage tank
(D) Store in a closed, dry container away from moisture

**32.** In the context of household cleaning products, which chemical is typically found in liquid drain cleaners to dissolve hair and grease?
(A) Sodium bicarbonate
(B) Sodium chloride
(C) Sodium hydroxide
(D) Calcium carbonate

**33.** The practical importance of Plaster of Paris in the construction industry primarily lies in its use for:
(A) Reinforcing load-bearing structural steel beams in large commercial buildings
(B) Creating smooth wall finishes and decorative false ceilings
(C) Waterproofing external concrete foundations against subterranean groundwater
(D) Acting as the primary hydraulic binder in heavy structural load-bearing concrete

**34.** What is the fundamental difference between biodegradable and non-biodegradable detergents?
(A) Biodegradable detergents dissolve completely in pure water, whereas non-biodegradable detergents remain totally insoluble
(B) Biodegradable detergents consist exclusively of inorganic salts, whereas non-biodegradable detergents contain synthetic polymers
(C) Biodegradable detergents form stable spherical micelles, whereas non-biodegradable detergents precipitate as insoluble scum
(D) Biodegradable detergents are decomposed by bacteria, non-biodegradable resist degradation

**35.** Consider the following statements:
**Assertion (A):** Soaps are 100% biodegradable and rarely cause severe water pollution.
**Reason (R):** The carbon chain in soap is derived from natural fats and oils, which are easily degraded by bacteria.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**36.** In large-scale industrial processes, what is the most common precaution when handling highly alkaline materials like sodium hydroxide?
(A) Using bare hands to continuously monitor subtle temperature changes during processing
(B) Storing bulk quantities in untreated aluminum containers to prevent atmospheric oxidation
(C) Wearing protective gloves and goggles with proper ventilation
(D) Mixing concentrated alkalis rapidly with strong mineral acids for immediate safe disposal

**37.** Which of the following is considered a non-ionic detergent?
(A) Pentaerythrityl stearate
(B) Sodium lauryl sulfate
(C) Sodium dodecylbenzenesulfonate
(D) Cetylpyridinium chloride

**38.** Why are non-ionic detergents particularly useful in liquid dishwashing formulations?
(A) They generate extremely high volumes of thick, stable foam during dishwashing
(B) They are chemically designed to be highly resistant to all biological degradation
(C) They carry a strong net positive ionic charge that actively binds to neutral dirt
(D) They clean grease and oil effectively without high foam

**39.** Which of the following processes requires brine (aqueous sodium chloride) as a primary raw material?
(A) Contact process
(B) Solvay process
(C) Haber process
(D) Ostwald process

**40.** Consider the following statements about the chemical behavior of baking soda:
I. It is an amphoteric substance.
II. It is a mild non-corrosive basic salt.
III. It releases hydrogen gas when treated with an acid.
IV. Its aqueous solution turns red litmus paper blue.
Which of the above statements are correct?
(A) I and II only
(B) II and IV only

NODIA

coagulation
(C) It lowers the pH of water to a level where bacteria cannot survive
(D) It removes the hardness of water

**62.** Which of the following chemical compounds is most appropriate for removing the permanent hardness of water?
(A) Baking soda
(B) Bleaching powder
(C) Washing soda
(D) Plaster of Paris

**63.** The chemical reaction between fats and sodium hydroxide to form soap and glycerol is an example of which type of reaction?
(A) Acid-catalyzed esterification
(B) Catalytic hydrogenation reaction
(C) Addition polymerization
(D) Saponification

**64.** Identify the odd one out based on the chemical nature of the substances.
(A) Sodium hydroxide
(B) Calcium hydroxide
(C) Sulfuric acid
(D) Sodium carbonate

**65.** Match the ions/components in List-I with their associated property/function in List-II in the context of cleaning agents.
**List I: (Ions/Components)**
P. Calcium and Magnesium ions
Q. Hydrophobic tail
R. Hydrophilic head
S. Polyphosphates
**List II: (Property/Function)**
1. Interacts with water molecules
2. Interacts with oil and dirt
3. Causes hardness in water
4. Acts as a builder in detergents
(A) P-4, Q-1, R-2, S-3
(B) P-3, Q-2, R-1, S-4
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-3, R-4, S-1

**66.** When storing bleaching powder, what happens if the container is left unsealed for a prolonged period?
(A) It rapidly gains water of crystallization and turns into a completely hard solid mass
(B) It undergoes violent spontaneous combustion upon contact with ambient room air
(C) It thermally decomposes directly into metallic calcium and elemental chlorine gas
(D) It reacts with atmospheric carbon dioxide, gradually losing chlorine

**67.** Which of the following is NOT a characteristic of a good quality soap?
(A) It contains free alkali above 10%
(B) It should dissolve very slowly when immersed in pure water
(C) It should not contain more than 10-15% total moisture content
(D) It should consistently form a rich, thick, and stable lather

**68.** Arrange the following chemical substances in increasing order of their pH in a 0.1 M aqueous solution at 25 degrees Celsius:
I. Baking soda
II. Sodium hydroxide
III. Washing soda
IV. Hydrochloric acid
(A) IV, I, III, II
(B) IV, III, I, II
(C) I, IV, III, II
(D) II, III, I, IV

NODIA

**69.** Transparent soaps are made by dissolving the soap in which of the following solvents and then evaporating the excess solvent?
(A) Ethanol
(B) Glycerol
(C) Acetone
(D) Kerosene

**70.** Consider the following statements about the industrial use of washing soda:
I. It is extensively used in the glass, soap, and paper industries.
II. It is used in the manufacture of sodium compounds such as borax.
III. It is widely employed as a catalyst in petroleum refining.
Which of the statements is/are correct?
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

**71.** The "Auto-oxidation" of oils and fats in soap can lead to rancidity. Which additives are commonly used in soaps to prevent this process?
(A) Chemical surfactants
(B) Antioxidants
(C) Inorganic detergent builders

(C) II and III only
(D) I, II and III

**11.** What structural feature is primarily responsible for a detergent being non-biodegradable?
(A) The presence of a sodium ion
(B) A highly branched hydrocarbon chain
(C) A straight, unbranched hydrocarbon chain
(D) The presence of a sulfate group

**12.** In the context of the cleansing action of soap, what is a micelle?
(A) A crystalline lattice structure formed by soap molecules in the solid state
(B) A spherical aggregate of soap molecules with hydrophobic tails inward
(C) A floating surface layer of insoluble calcium salts formed in hard water
(D) A secondary chemical byproduct derived from the saponification reaction

**13.** Why does soap fail to exhibit effective cleansing action in hard water?
(A) It forms insoluble precipitates with calcium and magnesium ions
(B) It dissolves completely in hard water without producing any stable lather
(C) It reacts rapidly with sodium ions to produce an unstable volatile compound
(D) Hard water maintains a pH level that is far too alkaline for soap function

**14.** Which chemical is most commonly used in municipal water treatment plants to disinfect drinking water?
(A) Sodium bicarbonate
(B) Calcium sulfate hemihydrate
(C) Calcium oxychloride
(D) Sodium carbonate decahydrate

**15.** Consider the following statements:
**Assertion (A):** Plaster of Paris is widely used in hospitals for setting fractured bones.
**Reason (R):** On mixing with a suitable amount of water, Plaster of Paris sets into a hard solid mass due to the formation of gypsum.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**16.** Which temperature is critical for the conversion of gypsum to Plaster of Paris, above which the process fails to yield the desired product?
(A) 273 K (0 Celsius)
(B) 373 K (100 Celsius)
(C) 473 K (200 Celsius)
(D) 573 K (300 Celsius)

**17.** The production cycle of sodium chloride-based industrial chemicals does not directly yield which of the following compounds?
(A) Sodium hydroxide
(B) Bleaching powder
(C) Chlorine gas
(D) Sodium bicarbonate

**18.** In the Chlor-Alkali process, what are the three main products obtained from the electrolysis of aqueous sodium chloride?
(A) Sodium metal, elemental chlorine gas, and liquid water
(B) Sodium carbonate, oxygen gas, and flammable hydrogen gas
(C) Sodium hypochlorite, chlorine gas, and elemental oxygen gas
(D) Sodium hydroxide, chlorine gas, and hydrogen gas

**19.** During the Chlor-Alkali process, at which electrode is chlorine gas liberated?
(A) The anode
(B) The cathode
(C) Both anode and cathode
(D) It remains dissolved in the solution and is not liberated

**20.** Consider the following statements about the role of bleaching powder in daily use:
I. It is used for bleaching cotton and linen in the textile industry.
II. It is used as an oxidizing agent in many chemical industries.
III. It is used to make drinking water free from germs.
IV. It is used as a major ingredient in baking powder.
Which of the given statements are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) I, II and III only
(D) II, III and IV only

Downloaded from www.pdf.tube

(B) Sodium bicarbonate
(C) Hydrated calcium sulfate
(D) Anhydrous calcium chloride

**82.** Which of the following represents the correct behavior of soap in an acidic solution?
(A) Its overall cleansing efficiency and lathering ability increases significantly
(B) It chemically transforms directly into a functional synthetic anionic detergent
(C) It rapidly decomposes to release large volumes of carbon dioxide gas into air
(D) It precipitates as insoluble free fatty acids

**83.** Why do non-ionic detergents perform effectively in hard water?
(A) Lacking ionic heads, they do not form insoluble salts with hardness ions
(B) They react with hard water to form highly soluble, non-precipitating calcium and magnesium complexes
(C) They chemically destroy and neutralize all calcium and magnesium cations present in hard water
(D) They are completely insoluble in water, floating on the surface to trap grease and dirt particles

**84.** Which of the following elements is critical for the bleaching action of bleaching powder in aqueous solution?
(A) Oxygen
(B) Calcium
(C) Chlorine
(D) Hydrogen

**85.** Match the specific application in List-I with the corresponding chemical compound in List-II.
**List I: (Applications)**
P. Setting fractured bones
Q. Making baking powder
R. Removing permanent hardness of water
S. Sterilizing drinking water
**List II: (Chemical compounds)**
1. Baking soda
2. Bleaching powder
3. Washing soda
4. Plaster of Paris
(A) P-4, Q-1, R-3, S-2
(B) P-3, Q-2, R-1, S-4
(C) P-4, Q-3, R-1, S-2
(D) P-1, Q-4, R-2, S-3

**86.** The cleansing capability of a surfactant in water is primarily due to its ability to lower which physical property of water?
(A) Boiling point
(B) Density
(C) Specific heat capacity
(D) Surface tension

NODIA

**87.** What happens when carbon dioxide gas is passed through an aqueous solution of sodium carbonate?
(A) Strongly caustic sodium hydroxide solution is formed
(B) Sodium bicarbonate precipitates
(C) Commercial bleaching powder is rapidly synthesized
(D) The solution rapidly turns strongly acidic in nature

**88.** Which of the following represents the correct sequence when gypsum is heated progressively?
(A) Anhydrous Calcium Sulfate → Gypsum → Plaster of Paris
(B) Gypsum → Plaster of Paris → Anhydrous Calcium Sulfate (upon further heating)
(C) Plaster of Paris → Anhydrous Calcium Sulfate → Gypsum
(D) Gypsum → Anhydrous Calcium Sulfate → Plaster of Paris

**89.** Which of the following is NOT an application of washing soda?
(A) Softening of hard water
(B) Domestic cleaning agent
(C) Manufacture of borax
(D) Antacid in medicines

**90.** Consider the following statements regarding the safety and storage of everyday chemicals:
I. Baking soda must be kept away from acidic materials to prevent unintentional carbon dioxide release.
II. Plaster of Paris should be stored in moisture-proof containers to prevent it from setting into gypsum.
III. Washing soda crystals should be stored in open, damp environments to maintain their hydration.
Which of the statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

II. Algal blooms deplete dissolved oxygen in water, endangering aquatic life.
III. Phosphate-free detergents completely eliminate all forms of water pollution.
Which of the statements is/are correct?
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

**51.** The problem of soap efficiency in hard water is resolved by using synthetic detergents. Why?
(A) Calcium and magnesium salts of detergents are soluble in water.
(B) Detergents are significantly more acidic in aqueous solution than traditional soaps.
(C) Synthetic detergents do not possess non-polar hydrophobic hydrocarbon chains.
(D) Detergents chemically precipitate all calcium and magnesium hardness-causing ions.

**52.** When Plaster of Paris is mixed with water, it sets into a hard mass. This process is:
(A) Endothermic
(B) Isothermic
(C) Exothermic
(D) Reversible at room temperature

**53.** Which chemical compound is traditionally used by potters to make casts and moulds for ceramics?
(A) Plaster of Paris
(B) Washing soda
(C) Baking soda
(D) Bleaching powder

**54.** Which of the following represents the correct reaction for the preparation of Plaster of Paris from gypsum?
(A) $CaSO_4.1/2H_2O + 1.5\ H_2O \rightarrow CaSO_4.2H_2O$
(B) $CaSO_4 \rightarrow CaSO_4.2H_2O$
(C) $CaSO_4.2H_2O \rightarrow CaO + SO_3 + 2H_2O$
(D) $CaSO_4.2H_2O \rightarrow CaSO_4.1/2H_2O + 1.5\ H_2O$

**55.** Consider the following statements:
**Assertion (A):** Baking powder is preferred over baking soda alone in making cakes.
**Reason (R):** Baking powder contains tartaric acid which neutralizes the bitter-tasting sodium carbonate produced during heating.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**56.** What is the role of sodium chloride in the soap manufacturing process?
(A) It acts as a primary chemical catalyst to speed up the saponification reaction
(B) It provides the essential sodium cations required for forming the soap molecule
(C) It precipitates soap from the aqueous solution
(D) It completely neutralizes any unreacted excess alkali remaining in the mixture

**57.** Which type of synthetic detergent is commonly used in hair shampoos?
(A) Non-ionic detergents
(B) Anionic detergents
(C) Soap-based detergents
(D) Cationic detergents

**58.** The Chlor-Alkali industry is an energy-intensive process. What is the principal source of energy driving the chemical transformation?
(A) Electrical energy for electrolysis
(B) Thermal energy from coal combustion
(C) Chemical energy from exothermic reactions
(D) Solar energy

**59.** Which product of the Chlor-Alkali process is extensively used in the hydrogenation of vegetable oils?
(A) Chlorine gas
(B) Hydrogen gas
(C) Sodium hydroxide
(D) Hydrochloric acid

**60.** Consider the following statements about sodium bicarbonate:
I. It is an active ingredient in antacids.
II. It is used in soda-acid fire extinguishers.
III. It undergoes thermal decomposition to yield carbon monoxide.
IV. It is slightly soluble in water.
Which of the given statements are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II, III and IV only
(D) I, III and IV only

**61.** Why is bleaching powder considered an effective disinfectant for drinking water?
(A) It releases chlorine in water which kills pathogenic bacteria
(B) It traps physical impurities through

Click Here to Buy book on Amazon

oxidize and eliminate deep stains
(B) They significantly soften fabric feel by depositing a coating on fibers
(C) They actively prevent the fading and degradation of delicate natural dyes
(D) They absorb UV light and emit blue light to appear whiter

**103.** Which of the following is a known safety hazard associated with the accidental mixing of household bleach (sodium hypochlorite base) and toilet bowl cleaners (acid base)?
(A) Spontaneous explosion
(B) Release of highly toxic chlorine gas
(C) Formation of hazardous radioactive isotopes
(D) Rapid freezing of the mixture

**104.** What is the most appropriate initial first aid treatment if concentrated sodium hydroxide solution accidentally spills on a worker's skin in a chemical plant?
(A) Apply a strong acid like hydrochloric acid to neutralize it
(B) Wipe it off with a dry cloth and apply a bandage
(C) Wash thoroughly with copious amounts of water immediately
(D) Apply baking soda powder to the area

**105.** Match the synthetic detergent types in List-I with their characteristic property or application in List-II.
**List I: (Synthetic detergent types)**
P. Anionic detergent
Q. Cationic detergent
R. Non-ionic detergent
S. Branched-chain detergent
**List II: (Properties/Applications)**
1. Poor biodegradability
2. Used in hair conditioners and has germicidal properties
3. Major component of household laundry powders
4. Liquid dishwashing detergents without ions
(A) P-2, Q-3, R-1, S-4
(B) P-3, Q-4, R-2, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-3, Q-2, R-4, S-1

**106.** The difference in chemical structure between an oil and a fat, used in soap making, is primarily based on:
(A) Degree of unsaturation in hydrocarbon chains
(B) The specific type of alkali reagent used during the chemical saponification reaction
(C) The presence or absence of nitrogen atoms within the main long hydrocarbon chain
(D) The total number of glycerol molecules chemically attached to the fatty acid backbone

**107.** Which component is responsible for the hardness of water but is NOT precipitated by boiling the water?
(A) Calcium bicarbonate
(B) Calcium sulfate
(C) Magnesium bicarbonate
(D) Carbon dioxide

**108.** Arrange the following chemical formulations based on their typical pH in aqueous solution, from most acidic to most basic:
I. Liquid toilet bowl cleaner (Hydrochloric acid base)
II. Laundry detergent solution (Sodium carbonate builder)
III. Pure distilled water
IV. Drain cleaner (Sodium hydroxide base)
(A) I, III, II, IV
(B) III, I, II, IV
(C) I, II, III, IV
(D) IV, II, III, I

**109.** Which chemical compound is produced in the largest volume worldwide, often regarded as an indicator of a country's industrial strength, and is essential for manufacturing detergents and fertilizers?
(A) Sulfuric acid
(B) Sodium chloride
(C) Calcium carbonate
(D) Sodium hydroxide

NODIA

**110.** Consider the following statements about the differences between soaps and detergents:
I. Soaps are derived from natural resources, whereas most synthetic detergents are derived from petrochemicals.
II. Soaps perform better in hard water than detergents.
III. Synthetic detergents can be tailored for specific applications (e.g., low-foaming, cold-water efficient).
Which of the statements is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only

ensuring rapid microbial biodegradation in environment. Additionally, reducing or eliminating phosphate builders prevents nutrient enrichment in water bodies. Replacing anionic surfactants with cationic ones is not a control measure due to cationic toxicity.

**31.** (D) Store in a closed, dry container away from moisture
Safe storage of bleaching powder requires keeping it in a sealed, airtight container located in a cool, dry environment away from moisture and direct sunlight. Atmospheric carbon dioxide and ambient humidity react with calcium oxychloride over time, causing gradual decomposition and loss of active chlorine, thereby diminishing its overall effectiveness.

**32.** (C) Sodium hydroxide
Sodium hydroxide, commonly called caustic soda, is the principal active chemical ingredient found in heavy-duty commercial drain cleaners. Its strongly alkaline nature enables it to chemically saponify grease and hydrolyze proteins, hair, and organic matter blocking plumbing pipes, converting insoluble blockages into water-soluble substances that are easily flushed away.

**33.** (B) Creating smooth wall finishes and decorative false ceilings
Plaster of Paris is widely utilized in modern interior construction for finishing interior brick walls and creating decorative false ceilings. When mixed with water, it forms a workable paste that can be easily smoothed or molded before it quickly sets into a hard, rigid mass with minimal volumetric shrinkage and cracking.

**34.** (D) Biodegradable detergents are decomposed by bacteria, non-biodegradable resist degradation
The primary distinction between biodegradable and non-biodegradable detergents lies in their susceptibility to microbial decomposition. Biodegradable detergents possess unbranched straight hydrocarbon chains that bacteria in sewage treatment plants can easily digest. Non-biodegradable detergents contain complex branched hydrocarbon chains that resist bacterial enzymatic breakdown, leading to persistent environmental accumulation.

**35.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Traditional soaps are completely biodegradable because their long hydrocarbon chains originate from natural plant oils and animal fats. Soil and water bacteria possess natural enzymes capable of rapidly breaking down these linear carboxylic chains into simple inorganic molecules, preventing soap accumulation and minimizing aquatic pollution in natural ecosystems.

**36.** (C) Wearing protective gloves and goggles with proper ventilation
Concentrated sodium hydroxide is a highly corrosive alkali capable of causing severe chemical burns upon skin contact and permanent ocular damage upon eye exposure. Standard industrial safety protocols dictate that workers must wear protective chemical-resistant gloves, safety goggles, and face shields while operating in well-ventilated areas equipped with emergency eyewash facilities.

**37.** (A) Pentaerythrityl stearate
Non-ionic detergents possess polar functional groups capable of hydrogen bonding with water without ionizing into cations or anions in aqueous solution. Pentaerythrityl stearate, formed by esterifying polyhydric alcohols with fatty acids, contains uncharged ester and hydroxyl polar heads, placing it squarely in the class of non-ionic synthetic detergents.

**38.** (D) They clean grease and oil effectively without high foam
Non-ionic detergents are particularly suited for liquid dishwashing formulations because they effectively emulsify oils and greasy food residues without generating excessive, unstable foam that is difficult to rinse. Their uncharged molecular structure functions reliably across varying water temperatures and hardness levels while maintaining mildness toward skin during manual washing.

**39.** (B) Solvay process
The industrial Solvay process synthesizes sodium carbonate using concentrated brine, which is aqueous sodium chloride, alongside ammonia and limestone as primary raw materials. Sodium chloride supplies the essential sodium ions that combine with hydrogen carbonate species to form sodium bicarbonate precipitate, which is subsequently calcined into soda ash.

Downloaded from www.pdf.tube

# STUDYING FROM PDFs?

# THINK AGAIN.

If you are studying only from PDFs,
you are wasting valuable time.

Research shows that learning from

**PRINTED BOOKS** has up to

**4× HIGHER RETENTION**

than studying from screens.

**PRINT BOOK = BETTER MEMORY**

**PDF = LOWER RETENTION**

Those who study from **PRINTED BOOKS**
move **AHEAD.**

Others are left **BEHIND**
in competition.

In competitive exams,
being average is not enough.

## STAY ONE STEP AHEAD.

(A) Solvated hydrated calcium metal cations
(B) Highly reactive dissolved hydroxide anions
(C) Dissolved atmospheric carbon dioxide gas
(D) Nascent oxygen from hypochlorous acid

**122.** Which of the following statements about the micelle structure is most accurate?
(A) The hydrophilic surface interacts with surrounding water molecules.
(B) The inner non-polar hydrophobic core dissolves completely in surrounding water.
(C) Dirt particles are trapped strictly on the outer hydrophilic surface of micelle.
(D) Micelles form large rigid crystalline structures visible to the unaided naked eye.

**123.** Which of the following is a common building block (raw material) in the petrochemical synthesis of synthetic detergents?
(A) Natural unrefined palm oil triglyceride
(B) Benzene and long-chain alkenes
(C) Processed animal tallow fat extract
(D) Pure organic glycerol byproduct liquid

**124.** How is the concentration of hard-water ions ($Ca_2$+ and Mg2+) typically reduced in modern dishwasher systems to ensure detergents work efficiently?
(A) By automatically injecting excess commercial soap into the main washing cycle
(B) By using an ion-exchange resin regenerated with sodium chloride
(C) By continuously boiling incoming hard water inside the machine heating chamber
(D) By passing all incoming water through an activated carbon charcoal filter bed

**125.** Which chemical process is crucial for artisan dyers in traditional textile industries to prepare cloth before applying natural dyes?
(A) Bleaching the fabric using bleaching powder or natural alternatives
(B) Application of Plaster of Paris slurry onto fabric surface prior to dyeing
(C) Alkaline saponification treatment of structural fabric fibers in heavy tanks
(D) High temperature thermal curing of raw fabric with concentrated baking soda

**126.** A candidate observes that a chemical compound 'X' is used extensively in the glass industry. Its aqueous solution is basic in nature. What is 'X'?
(A) Baking soda
(B) Bleaching powder
(C) Washing soda
(D) Plaster of Paris

**127.** Which of the following combinations of chemicals is considered extremely dangerous due to the release of toxic chloramine vapor?
(A) Dilute baking soda and vinegar mixture
(B) Commercial washing soda and household soap
(C) Dry Plaster of Paris powder and pure water
(D) Bleach and ammonia

NODIA

**128.** What distinguishes a 'soft soap' from a 'hard soap'?
(A) Soft soaps are sodium salts, whereas hard soaps are calcium salts
(B) Soft soaps contain synthetic detergents, whereas hard soaps do not
(C) Soft soaps are potassium salts; hard soaps are sodium salts
(D) Soft soaps are completely anhydrous, whereas hard soaps hold water

**129.** The term 'Saponification Value' is important in the soap industry. What does it measure?
(A) The maximum relative foaming capacity and foam stability of resulting soap
(B) The alkali amount required to saponify a given fat or oil quantity
(C) The exact residual percentage of unevaporated moisture remaining in soap
(D) The total environmental biodegradability index rating of finished soap

**130.** Why is Plaster of Paris specifically used for sealing air gaps in laboratory apparatus?
(A) It rapidly absorbs all surrounding airborne gases within the apparatus
(B) It remains highly flexible, elastic, and rubber-like after complete drying
(C) It chemically reacts with oxygen inside the apparatus to form a vacuum
(D) It expands slightly upon setting to form an airtight seal

**131.** Which of the following best explains why baking soda provides relief from stomach acidity?
(A) Its mild basic nature neutralizes excess stomach hydrochloric acid
(B) It acts directly as a local chemical anesthetic to numb nerve tissue
(C) It coats the entire inner stomach lining with an insoluble protective layer
(D) It significantly slows down the natural rate

(D) I, II and III

**111.** What is the fundamental principle behind using sodium bicarbonate in fire extinguishers?
(A) It rapidly cools the combustion zone by absorbing heat during endothermic chemical breakdown
(B) It rapidly expands upon contact with heat to physically smother flames with fine solid powder
(C) It reacts directly with liquid and gaseous fuels to chemically render them non-combustible
(D) It reacts with acid to release $CO_2$ gas, cutting off oxygen

**112.** The "setting" of Plaster of Paris is accompanied by an increase in temperature. This indicates that the hydration process is:
(A) Reversible
(B) Endothermic
(C) Exothermic
(D) Catalytic

**113.** Which of the following chemical formulas correctly represents washing soda?
(A) $Na_2CO_3$
(B) $Na_2CO_3.10H_2O$
(C) $Na_2CO_3.H_2O$
(D) $NaHCO_3$

**114.** Why is sodium chloride added towards the end of the soap manufacturing process?
(A) To neutralize all unreacted residual alkali remaining from the reaction
(B) To act as a long-term preservative preventing microbial decomposition
(C) To significantly enhance and increase the overall foaming capacity of soap
(D) To reduce soap solubility, causing it to precipitate out

**115.** Consider the following statements:
**Assertion (A):** Non-ionic detergents do not form scum in hard water.
**Reason (R):** They do not contain ions that can react with calcium and magnesium ions present in hard water.
(A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
(B) Both Assertion (A) and Reason (R) are true but R is not the correct explanation of A.
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**116.** In the context of environmental science, what term describes the foaming seen in rivers and streams due to historical use of certain synthetic detergents?
(A) Industrial saponification process
(B) Ecological biomagnification phenomenon
(C) Alkylbenzene sulfonate pollution
(D) Soil and water salinization effect

**117.** Which of the following acts as the primary cleaning agent in most modern commercial laundry powders?
(A) Linear alkylbenzene sulfonates
(B) Saturated sodium stearate soap salt
(C) Inorganic calcium hypochlorite bleach
(D) Natural potassium palmitate fatty salt

**118.** When baking soda is heated during the baking process, which solid compound remains in the baked food?
(A) Sodium hydroxide
(B) Sodium chloride
(C) Sodium oxide
(D) Sodium carbonate

**119.** A white powder is used by doctors to support fractured bones. What happens when this powder is heated strongly above 100 degrees Celsius (373 K)?
(A) It chemically transforms into hydrated sodium carbonate washing soda crystals
(B) It loses water of crystallization, forming dead burnt plaster
(C) It completely sublimates directly from solid phase into gaseous phase
(D) It absorbs atmospheric moisture rapidly to form an aqueous solution

**120.** Consider the following practical applications of sodium hydroxide:
I. Manufacturing of soaps and detergents
II. Paper manufacturing
III. De-greasing metals
IV. Disinfecting drinking water
Which of the above are correct applications of sodium hydroxide?
(A) I, II and III only
(B) I, II and IV only
(C) II, III and IV only
(D) I, III and IV only

**121.** The property of bleaching powder to act as a bleaching agent is due to its oxidizing nature. Which active species causes this oxidation?

Click Here to Buy book on Flipkart

# ANSWERS

**1.** (B) Calcium hypochlorite, $CaOCl_2$
Bleaching powder is chemically known as calcium hypochlorite or calcium oxychloride, represented by the chemical formula $CaOCl_2$. It is produced on an industrial scale by passing chlorine gas over dry slaked lime, also known as calcium hydroxide. This compound serves as a powerful bleaching agent, disinfectant, and strong oxidizing agent in various applications.

**2.** (D) Passing chlorine gas over dry slaked lime
The industrial preparation of bleaching powder involves the chemical reaction between chlorine gas and dry slaked lime, which is calcium hydroxide. When dry slaked lime reacts with chlorine gas at room temperature, calcium oxychloride along with water is produced. The process requires dry slaked lime because moisture reduces overall yield and purity.

**3.** (A) It releases carbon dioxide gas upon heating, making the dough rise
Baking soda, known chemically as sodium bicarbonate, decomposes thermally when subjected to heat during baking. This reaction produces carbon dioxide gas, water vapor, and sodium carbonate. As the carbon dioxide gas expands and tries to escape through the dough, it forms bubbles that cause the bread or cake dough to expand and rise.

**4.** (C) Alkaline
Washing soda is chemically sodium carbonate decahydrate, which is a salt formed from a strong base, sodium hydroxide, and a weak acid, carbonic acid. Dissolving washing soda in water leads to salt hydrolysis, yielding hydroxide ions in the solution. Consequently, the resulting aqueous solution exhibits basic properties and turns red litmus paper blue.

**5.** (C) 10
The chemical formula of washing soda is written as $Na_2CO_3.10H_2O$, indicating that each formula unit contains ten molecules of water of crystallization. These water molecules are bound within the crystal structure, maintaining its crystalline form. Upon exposure to dry air, washing soda loses nine water molecules through efflorescence to become a monohydrate compound.

**6.** (D) It absorbs moisture from the air to form baking soda
Plaster of Paris is calcium sulfate hemihydrate with the formula $CaSO_4.1/2H_2O$, synthesized by heating gypsum at carefully controlled temperatures around 373 K. Heating gypsum above this temperature produces anhydrous calcium sulfate, called dead burnt plaster. When mixed with water, Plaster of Paris rehydrates to form gypsum, not baking soda, which is sodium bicarbonate.

**7.** (B) Sodium or potassium salts of fatty acids
Saponification is the chemical hydrolysis reaction of triglycerides found in fats and oils using an aqueous alkali, such as sodium hydroxide or potassium hydroxide. This process breaks the ester bonds to produce glycerol alongside the carboxylate salts of long-chain fatty acids. These sodium or potassium fatty acid salts constitute the essential cleansing material known as soap.

**8.** (A) Saponification → Separation of glycerin → Purification → Finishing
The commercial manufacturing sequence for soap begins with saponification, where fats and oils react with alkaline solution. Next, glycerin is separated from the reaction mixture through salting out with sodium chloride. The crude soap then undergoes purification to eliminate residual impurities, followed by final finishing steps including drying, perfuming, and shaping into bars.

**9.** (D) Glycerol
During the saponification process, triglyceride molecules present in natural fats or oils are hydrolyzed by alkaline solutions. This chemical reaction generates soap salts while splitting off the triol compound known as glycerol or glycerin. Glycerol is recovered as a valuable industrial byproduct extensively used in pharmaceuticals, cosmetics, food items, and explosive production.

Downloaded from www.pdf.tube

waters. When these dense algal mats die, aerobic microorganisms consume large quantities of dissolved oxygen during decomposition, creating hypoxic conditions that threaten fish and aquatic organisms. While phosphate-free formulas reduce nutrient loading, detergents can still cause aquatic pollution.

**51.** (A) Calcium and magnesium salts of detergents are soluble in water.
Synthetic detergents perform effectively in hard water because their calcium and magnesium sulfonate or sulfate salts are completely water-soluble. Unlike traditional carboxylate soaps, which form insoluble scum precipitates with hardness ions, detergent surfactant molecules remain fully dissolved and active, maintaining excellent lathering and cleansing power regardless of water hardness.

**52.** (C) Exothermic
The setting of Plaster of Paris upon mixing with water is a chemical hydration process that transforms calcium sulfate hemihydrate back into crystalline gypsum dihydrate. This rehydration reaction releases chemical energy in the form of heat, making the overall setting process exothermic and causing a noticeable temperature rise in the setting mass.

**53.** (A) Plaster of Paris
Potters and ceramic artisans extensively utilize Plaster of Paris to craft durable moulds and casts for pottery production. When mixed with water, Plaster of Paris forms a fluid slurry that easily fills intricate mold details before setting into a hard solid that expands slightly, producing sharp and precise ceramic reproductions.

**54.** (D) $CaSO_4.2H_2O \rightarrow CaSO_4.1/2H_2O + 1.5\ H_2O$
Converting gypsum to Plaster of Paris involves controlled thermal dehydration at 373 K. One mole of calcium sulfate dihydrate, representing gypsum, loses one and a half moles of water of crystallization to yield one mole of calcium sulfate hemihydrate, which corresponds to the balanced formula for Plaster of Paris.

**55.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Baking powder is preferred over raw baking soda in baking because baking soda yields alkaline sodium carbonate upon thermal decomposition, creating a bitter taste. The tartaric acid present in baking powder reacts with sodium carbonate, neutralizing it into neutral sodium tartrate while producing additional carbon dioxide gas to lift baked goods.

**56.** (C) It precipitates soap from the aqueous solution
Sodium chloride is added at the end of the soap-making process to perform salting out. Increasing the sodium ion concentration in the aqueous mixture drastically reduces the solubility of fatty acid sodium salts due to the common ion effect, causing crude soap to precipitate as a solid floating layer.

**57.** (D) Cationic detergents
Modern hair shampoos and conditioners frequently incorporate cationic detergents containing quaternary ammonium salts. The positively charged ammonium heads adsorb strongly onto negatively charged protein surfaces of hair strands, neutralizing static charges, reducing hair friction, and leaving hair manageable, soft, and conditioned after washing.

**58.** (A) Electrical energy for electrolysis
The Chlor-Alkali industry relies primarily on electrical energy to drive non-spontaneous electrolytic decomposition of aqueous sodium chloride. Passing a direct electric current through brine forces chloride ions to oxidize at the anode and water molecules to reduce at the cathode, yielding chlorine, hydrogen, and sodium hydroxide on a massive industrial scale.

**59.** (B) Hydrogen gas
Hydrogen gas liberated at the cathode during the Chlor-Alkali process is harvested for catalytic hydrogenation of vegetable oils. Passing hydrogen gas through liquid unsaturated plant oils in the presence of a nickel catalyst converts liquid triglycerides into solid saturated fats, producing vegetable ghee and margarine for food manufacturing.

**60.** (A) I, II and IV only
Sodium bicarbonate is a mild basic salt utilized as an active antacid to neutralize stomach acidity and as a $CO_2$-generating agent in soda-acid fire extinguishers. It is moderately soluble in water. Upon thermal breakdown, it produces carbon dioxide gas rather than toxic carbon monoxide gas.

NODIA

**20.** (C) I, II and III only
Bleaching powder is utilized for bleaching textiles such as cotton and linen, as a versatile oxidizing agent in chemical synthesis, and as a disinfectant for purifying drinking water. However, it is not used in baking powder formulations, which instead combine sodium bicarbonate with a mild edible organic acid like tartaric acid.

**21.** (A) Chlorine
When bleaching powder is exposed to atmospheric carbon dioxide or treated with dilute mineral acids, it undergoes chemical decomposition to release free chlorine gas. This liberated chlorine dissolves in water to form hypochlorous acid, which decomposes to yield atomic nascent oxygen, serving as the ultimate active bleaching species responsible for decolorization.

**22.** (D) Tartaric acid
Baking powder is formulated as a dry mixture containing sodium bicarbonate and a solid mild edible acid, most commonly tartaric acid. While baking soda alone generates basic sodium carbonate upon thermal decomposition, the inclusion of tartaric acid ensures a controlled acid-base neutralization reaction that converts sodium carbonate into tasteless neutral sodium tartrate.

**23.** (B) It neutralizes sodium carbonate formed on heating to prevent a bitter taste
Heating sodium bicarbonate during baking produces sodium carbonate, which imparts an unappealing bitter taste and high alkalinity to baked goods. The mild edible acid added to baking powder reacts with sodium carbonate as it forms, neutralizing it into a neutral salt while generating extra carbon dioxide gas to enhance batter expansion.

**24.** (C) Animal fats and vegetable oils
The traditional manufacturing of soap relies on natural triglycerides derived from animal fats or vegetable oils as primary raw materials. These glyceride esters contain long-chain hydrocarbon fatty acid residues, such as stearic, palmitic, and oleic acids, which are chemically cleaved by basic hydroxides to form water-soluble fatty acid carboxylate salts.

**25.** (D) P-2, Q-1, R-4, S-3
Sodium bicarbonate is used in soda-acid fire extinguishers due to carbon dioxide liberation. Calcium oxychloride acts as a disinfectant for water purification. Sodium carbonate removes permanent water hardness by precipitating soluble calcium and magnesium ions. Calcium sulfate hemihydrate is used to create casts, statues, and decorative plaster toys.

**26.** (A) Anionic detergents
Anionic detergents feature negatively charged polar head groups, such as alkyl sulfates or alkylbenzene sulfonates, attached to long hydrophobic hydrocarbon tails. They possess outstanding grease-emulsifying power and high foaming ability, making them the primary active cleaning agents used in household liquid dishwashing solutions, laundry detergent formulations, and general surface cleaners.

**27.** (B) Cationic detergents
Cetyltrimethylammonium bromide is a quaternary ammonium salt possessing a long hydrocarbon chain attached to a positively charged nitrogen atom. Because its active surfactant portion carries a net positive charge, it belongs to the class of cationic detergents, which exhibit notable germicidal and antistatic properties in fabric softeners and hair conditioners.

**28.** (A) II, III, IV, I
The industrial Solvay process follows a precise sequence to manufacture sodium carbonate. Brine is first saturated with ammonia gas. Carbon dioxide is then bubbled through the ammoniated brine to precipitate sodium bicarbonate. After filtering the precipitated sodium bicarbonate, it is subjected to calcination by heating, yielding solid anhydrous sodium carbonate.

**29.** (A) Eutrophication of water bodies
Commercial detergent formulations frequently contain polyphosphate compounds acting as builders to sequester hard water minerals. When wastewater containing excessive phosphates enters natural aquatic systems, these nutrients stimulate rapid growth of algal blooms. As the dense algae dies and decomposes, aerobic bacteria consume dissolved oxygen, causing severe aquatic hypoxia and ecosystem degradation.

**30.** (A) I and II only
To mitigate water pollution caused by synthetic cleaning products, manufacturers incorporate straight unbranched alkyl chains into surfactants,

Click Here to Buy book on Amazon

of digestive gastric motility

**132.** What environmental mitigation strategy is recommended for industries discharging alkaline wastewater from the Chlor-Alkali process?
(A) Immediate direct discharge into open ocean waters where dilution naturally occurs
(B) Evaporating all industrial wastewater liquid completely into ambient atmosphere
(C) Acid neutralization prior to safe discharge
(D) Mixing untreated alkaline effluent directly with municipal raw sewage streams

**133.** Which of the following synthetic detergents is considered environmentally friendly due to its high biodegradability?
(A) Linear alkylbenzene sulfonate (LAS)
(B) Tetrapropylene benzene sulfonate (TPBS)
(C) Highly branched alkyl sulfates
(D) Nonylphenol ethoxylates

**134.** Which property of gypsum makes it unsuitable for direct use in casting moulds, necessitating its conversion to Plaster of Paris?
(A) Gypsum is inherently highly toxic to human skin and causes severe irritation
(B) Gypsum is prohibitively expensive to extract and process for casting purposes
(C) Gypsum instantly dissolves completely in water to produce a thin liquid solution
(D) Fully hydrated, gypsum does not react with water to form a setting mass

**135.** In the preparation of washing soda, the initial precipitate of sodium bicarbonate is formed. Why does this compound precipitate out from the reaction mixture in the Solvay process?
(A) It reacts with ammonia gas to form an insoluble solid metal complex
(B) It has low solubility in cold brine
(C) It immediately decomposes spontaneously into solid sodium carbonate
(D) It rapidly sublimates into gaseous form at normal room temperature

**136.** Which of the following is NOT a constituent of typical commercial bleaching powder?
(A) Calcium hypochlorite
(B) Calcium chloride
(C) Calcium sulfate
(D) Calcium hydroxide

**137.** Which of the following statements correctly identifies the function of glycerol in transparent soap?
(A) It significantly increases the overall alkalinity and pH of finished soap bars
(B) It renders the solid soap mass completely opaque, dense, and non-reflective
(C) It acts as a strong insoluble particulate abrasive for heavy-duty cleaning
(D) It acts as a solvent and humectant, imparting transparency and moisture

**138.** The cleaning action of soap is based on the formation of micelles. What minimum condition must be met in the solution for micelles to form?
(A) Soap concentration must exceed the Critical Micelle Concentration (CMC)
(B) The aqueous solution must be maintained at a temperature below 0 degrees Celsius
(C) The water used for dissolution must be completely pure, deionized distilled water
(D) The overall pH level of the solution must be rendered strongly acidic in nature

NODIA

**139.** Which industrial chemical is known by the commercial name 'Caustic Soda'?
(A) Sodium carbonate
(B) Sodium hydroxide
(C) Sodium bicarbonate
(D) Calcium hydroxide

**140.** Which of the following correctly describes the relationship between the structure of a detergent molecule and its ability to act as an emulsifier?
(A) Its entirely hydrophilic chemical structure allows oil and water to freely mix
(B) Its amphiphilic nature bridges the oil-water interface
(C) Its entirely hydrophobic hydrocarbon structure repels liquid water completely
(D) Its high molecular weight causes physical crushing and dispersal of oil droplets

**40.** (B) II and IV only
Baking soda is a mild non-corrosive basic salt derived from a strong base and a weak acid. In aqueous solution, it undergoes partial salt hydrolysis, creating excess hydroxyl ions that turn red litmus paper blue. It is not amphoteric nor does it evolve hydrogen gas upon reacting with acidic compounds.

**41.** (D) Sodium chloride, ammonia, and limestone
The industrial synthesis of sodium carbonate via the Solvay process requires three basic raw materials: sodium chloride, ammonia, and crushed limestone. Sodium chloride provides sodium ions, limestone undergoes thermal decomposition to supply carbon dioxide gas and lime, and ammonia acts as a carrier gas to generate intermediate ammonium hydrogen carbonate.

**42.** (A) Anhydrous sodium carbonate
Soda ash is the common chemical term referring specifically to anhydrous sodium carbonate, which has the molecular formula $Na_2CO_3$. It is obtained when hydrated sodium carbonate or sodium bicarbonate undergoes complete thermal dehydration at elevated temperatures, driving off all bound water of crystallization to leave behind a dry white powder.

**43.** (B) Efflorescence
Efflorescence is the chemical phenomenon where a hydrated crystalline salt spontaneously loses its water of crystallization to dry atmosphere. Washing soda decahydrate crystals, when exposed to unhumidified air at room temperature, gradually lose nine water molecules to form a fine monohydrate powder, demonstrating classic efflorescence behavior without external heating.

**44.** (B) Strong smell of chlorine
Commercial bleaching powder exhibits a distinctive pungent odor characteristic of elemental chlorine gas. This odor arises because calcium oxychloride continuously reacts with atmospheric carbon dioxide and ambient moisture, leading to slow chemical decomposition and constant release of trace chlorine gas into the surrounding air near storage containers.

**45.** (A) P-2, Q-4, R-3, S-1
Sodium hydroxide is produced industrially via the Chlor-alkali electrolytic process. Sodium carbonate is manufactured through the Solvay process using brine and limestone. Bleaching powder is synthesized by reacting chlorine gas with dry slaked lime. Soap is manufactured through the saponification reaction of natural fats with basic hydroxides.

**46.** (C) Hydrophobic tails point inwards and hydrophilic heads point outwards
When soap dissolves in water above its critical concentration, the molecules arrange themselves into spherical micelle structures. The long non-polar hydrocarbon tails are hydrophobic and cluster together in the interior core away from water, while the charged carboxylate ionic heads are hydrophilic and face outward into the surrounding polar aqueous environment.

**47.** (D) Glycerol
Glycerol is routinely incorporated into shaving soap formulations to act as a humectant. Its hygroscopic hydroxyl groups attract and retain moisture within the lather, preventing the shaving cream from drying out rapidly on the skin during application. Furthermore, it enhances lather smoothness and lubricates the skin surface for shaving.

**48.** (B) Hydrophobic tails attach to grease → Formation of micelle → Entrapment of grease in micelle center → Washing away with water
When cleaning greasy fabric, soap molecules first orient their hydrophobic hydrocarbon tails toward the oil stain. As surfactant concentration increases, spherical micelles assemble around the droplet, trapping the grease securely inside the non-polar inner core. Finally, rinsing with water carries the stable dispersed micelle emulsion away from the fabric surface.

**49.** (B) To soften water by sequestering calcium and magnesium ions
Detergent builders like sodium tripolyphosphate are key additives included in commercial laundry powders. Their primary chemical function is to bind and sequester calcium and magnesium ions responsible for water hardness, preventing these metal cations from interfering with surfactant molecules and thereby maximizing cleansing efficiency and preventing mineral deposition on clothes.

**50.** (B) I and II only
Eutrophication involves nutrient enrichment that fuels excessive algal blooms in surface

Downloaded from www.pdf.tube

**10.** (B) I and III only
Synthetic detergents are sodium salts of long-chain alkyl hydrogen sulfates or alkyl benzene sulfonates. Unlike soap, their calcium and magnesium salts are soluble in water, preventing the formation of insoluble scum in hard water. Furthermore, synthetic detergents retain their cleaning efficiency in slightly acidic solutions because their corresponding sulfonate acids remain soluble.

**11.** (B) A highly branched hydrocarbon chain
Non-biodegradability in synthetic detergents is primarily caused by extensive branching in their hydrophobic hydrocarbon chains. Microorganisms present in wastewater treatment systems struggle to enzymatically degrade highly branched hydrocarbon structures, leading to environmental persistence and foaming in waterways. Modern detergents utilize straight, unbranched chains to ensure rapid and efficient microbial breakdown.

**12.** (B) A spherical aggregate of soap molecules with hydrophobic tails inward
In an aqueous medium above the critical concentration, soap molecules spontaneously organize into spherical colloidal clusters called micelles. The long hydrocarbon tails are non-polar and hydrophobic, orienting inward away from water to enclose oily dirt. Meanwhile, the polar carboxylate ionic heads face outward to interact with surrounding water molecules, keeping the emulsion stabilized.

**13.** (A) It forms insoluble precipitates with calcium and magnesium ions
Hard water contains significant quantities of dissolved calcium and magnesium cations. When soap is added, the soluble sodium or potassium carboxylate salts react with these divalent metal cations to produce insoluble calcium and magnesium fatty acid salts. This sticky precipitate, called scum, consumes soap molecules and prevents lather formation during cleaning.

**14.** (C) Calcium oxychloride
Calcium oxychloride, commercially known as bleaching powder, is widely employed in municipal water treatment facilities to disinfect public drinking water supplies. Upon dissolving in water, it undergoes chemical dissociation to release hypochlorous acid and chlorine species, which act as powerful oxidizing agents that rapidly destroy harmful microorganisms and pathogenic bacteria.

**15.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Plaster of Paris is widely used in medical treatments to set fractured bones in position because of its unique hardening property. When mixed with an appropriate amount of water, it hydrates and recombines into gypsum, expanding slightly and setting into a rigid, hard crystalline solid mass that holds bone fragments immobile.

**16.** (B) 373 K (100 Celsius)
During the controlled manufacturing of Plaster of Paris, gypsum is heated to precisely 373 K. At this temperature, gypsum loses three-quarters of its water of crystallization to form calcium sulfate hemihydrate. If heating exceeds 373 K, all water is driven off, producing anhydrous calcium sulfate, which loses its desired setting properties.

NODIA

**17.** (B) Bleaching powder
The industrial electrolysis of aqueous sodium chloride directly yields sodium hydroxide, hydrogen gas, and chlorine gas. Furthermore, sodium chloride is converted via carbonation to sodium bicarbonate in the Solvay process. Bleaching powder is not a direct product of salt electrolysis, but requires reacting slaked lime with chlorine gas in a secondary step.

**18.** (D) Sodium hydroxide, chlorine gas, and hydrogen gas
The Chlor-Alkali process is an industrial electrolytic method used to electrolyze concentrated aqueous sodium chloride solution. During electrolysis, chlorine gas is liberated at the positive anode, hydrogen gas is evolved at the negative cathode, and sodium hydroxide remains dissolved in the surrounding aqueous solution, yielding three valuable industrial chemicals simultaneously.

**19.** (A) The anode
In the Chlor-Alkali electrolytic cell, chloride ions present in the concentrated brine migrate toward the positively charged anode. At the anode surface, chloride ions undergo oxidation by losing electrons to form elemental chlorine gas. Simultaneously, hydrogen ions migrate to the cathode to undergo reduction, evolving hydrogen gas at that electrode.

**61.** (A) It releases chlorine in water which kills pathogenic bacteria
Bleaching powder functions as an effective drinking water disinfectant because it releases chlorine species upon dissolving in water. The active hypochlorous acid and dissolved chlorine penetrate microbial cell membranes, oxidizing essential cellular enzymes and destroying disease-causing pathogens, bacteria, and viruses to render municipal water safe for consumption.

**62.** (C) Washing soda
Permanent hardness of water, caused by dissolved calcium and magnesium sulfates or chlorides, is effectively removed by adding washing soda. Sodium carbonate reacts with soluble divalent cations to form insoluble calcium carbonate and magnesium carbonate precipitates, which are easily filtered out, leaving softened water suitable for washing.

**63.** (D) Saponification
The reaction between ester bonds of fats and aqueous sodium hydroxide is classified as saponification, which is base-catalyzed ester hydrolysis. In this transformation, hydroxide ions nucleophilically attack triglyceride ester linkages, cleaving them to yield the alcohol glycerol and sodium carboxylate salts that function as commercial soap products.

**64.** (C) Sulfuric acid
Sulfuric acid is a strong mineral acid that releases hydronium ions in aqueous solutions, resulting in low pH values. In contrast, sodium hydroxide and calcium hydroxide are strong chemical bases, while sodium carbonate is a basic salt that hydrolyzes to form basic solutions, making sulfuric acid chemically distinct from the others.

**65.** (B) P-3, Q-2, R-1, S-4
Calcium and magnesium ions cause hardness in water. The hydrophobic hydrocarbon tail of a surfactant interacts with oil and grease stains. The hydrophilic polar head group interacts with polar water molecules. Polyphosphate builders function in detergents by sequestering metal cations to prevent precipitation and optimize cleaning performance.

**66.** (D) It reacts with atmospheric carbon dioxide, gradually losing chlorine
Storing bleaching powder in unsealed containers exposes it to atmospheric carbon dioxide and ambient moisture. Calcium oxychloride reacts slowly with carbon dioxide gas, producing solid calcium carbonate while liberating elemental chlorine gas into the air. Consequently, the chemical gradually loses active available chlorine content and loses its bleaching power.

**67.** (A) It contains free alkali above 10%
High quality commercial soap must contain minimal free alkali, typically well under 0.1%, to prevent skin irritation and tissue damage during use. Good soaps should dissolve at a controlled rate, maintain appropriate moisture levels between 10 and 15 percent, and produce stable lather to ensure safe and effective personal hygiene.

**68.** (A) IV, I, III, II
At equal concentrations, hydrochloric acid is a strong acid with the lowest pH value. Baking soda is a weakly basic salt with a moderately low basic pH around 8. Washing soda hydrolyzes to form a stronger basic solution with pH around 11. Sodium hydroxide is a strong alkali exhibiting the highest pH near 13.

**69.** (A) Ethanol
Transparent soaps are produced by dissolving boiled soap mass in ethanol, which acts as a clear organic solvent. The mixture is heated to achieve complete dissolution, after which any excess alcohol solvent is distilled off under controlled conditions, leaving behind a clear, homogenous, semi-transparent soap cake upon cooling.

**70.** (B) I and II only
Washing soda is manufactured on a massive scale for industrial applications, including glass making, soap production, and paper manufacturing. It also serves as an essential chemical precursor in synthesizing important sodium compounds like borax. However, it does not function as a catalyst in industrial petroleum refining operations.

**71.** (B) Antioxidants
Rancidity in soaps occurs when unreacted unsaturated fatty acid chains undergo atmospheric auto-oxidation, producing unpleasant odors, discoloration, and structural degradation over time. Soap manufacturers add small amounts of chemical antioxidants, such as vitamin E or synthetic phenolic compounds,

Click Here to Buy book on Flipkart

to inhibit oxidative degradation reactions and prolong product shelf life.

**72.** (C) It creates precise and sharp casts in moulds
During the setting reaction, Plaster of Paris undergoes a slight volumetric expansion of approximately 0.5 to 1 percent as gypsum crystals form and interlock. This expansion forces the setting plaster slurry tightly into every delicate cavity and detail of a mould, ensuring exceptionally sharp, precise, and accurate cast impressions.

**73.** (D) Soap has a carboxylate group; detergent has a sulfate/sulfonate group
The key chemical difference between soaps and synthetic anionic detergents resides in their polar hydrophilic head groups. Soap molecules contain a terminal carboxylate group ($-COO^- Na^+$) derived from natural fatty acids. Synthetic anionic detergents contain either a sulfate ($-OSO_3^- Na^+$) or sulfonate ($-SO_3^- Na^+$) group derived from petroleum hydrocarbons.

**74.** (A) Wearing full face shields, protective suits, and having safety showers on site
Operating personnel in Chlor-Alkali chemical plants handling concentrated sodium hydroxide must adhere to strict safety protocols. Mandatory personal protective equipment includes chemical face shields, splash-proof goggles, alkali-resistant suits, and rubber boots. Facilities must maintain easily accessible safety showers and eyewash stations for rapid emergency decontamination in case of spills.

**75.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Bleaching powder requires storage in opaque, tightly sealed containers to prevent loss of chemical efficacy. Exposure to ambient moisture and atmospheric carbon dioxide drives decomposition reactions, while light accelerates the breakdown of calcium oxychloride into calcium chloride and oxygen gas, systematically destroying its available active chlorine capacity.

**76.** (B) Sodium bicarbonate and sulfuric acid
Emergency soda-acid fire extinguishers store aqueous sodium bicarbonate in a main body container and concentrated sulfuric acid inside a sealed glass ampoule. When inverted or struck, the ampoule breaks, mixing the acid with bicarbonate solution. This chemical reaction rapidly generates abundant carbon dioxide gas, pressurizing the container to extinguish fires.

**77.** (A) Hydrochloric acid
Commercial liquid toilet bowl cleaners typically utilize hydrochloric acid as their active chemical agent. Hydrochloric acid effectively dissolves stubborn inorganic mineral deposits, calcium carbonate limescale, and iron rust stains adhering to porcelain surfaces by converting insoluble metal compounds into water-soluble chloride salts that rinse away easily.

**78.** (C) Dilute ammonium hydroxide
Commercial glass cleaners frequently incorporate dilute ammonium hydroxide as a primary active solvent. Ammonium hydroxide effectively saponifies greasy fingerprints and cuts through atmospheric film without attacking glass. Because ammonia evaporates rapidly at room temperature along with water, it leaves window surfaces clean, bright, and completely free of streak residues.

**79.** (D) Anhydrous calcium sulfate
Heating gypsum or Plaster of Paris above 373 K drives off all combined water of crystallization, resulting in completely dry anhydrous calcium sulfate ($CaSO_4$). This fully dehydrated form is commercially termed dead burnt plaster because it loses its rapid setting ability and will not readily harden upon adding water.

**80.** (A) I, II and IV only
The Solvay process is an economical industrial method using brine, limestone, and ammonia to produce sodium carbonate. Ammonia is efficiently recovered and recycled, while calcium chloride is generated as the principal byproduct. However, potassium carbonate cannot be produced via this method because intermediate potassium bicarbonate is excessively soluble in water.

**81.** (B) Sodium bicarbonate
Sodium bicarbonate is a primary active ingredient used in dry chemical powder fire extinguishers. When sprayed onto a fire, the high thermal energy causes sodium bicarbonate to rapidly decompose endothermically, absorbing heat and releasing large volumes of carbon dioxide gas that smother flames by displacing atmospheric oxygen surrounding fuel.

NODIA

**82.** (D) It precipitates as insoluble free fatty acids
When soap is introduced into an acidic solution, the excess hydronium ions protonate the ionic carboxylate head groups of soap molecules. This neutralization converts water-soluble sodium carboxylate salts into insoluble long-chain free fatty acids, which precipitate out of solution as a solid residue, completely destroying the cleansing ability of soap.

**83.** (A) Lacking ionic heads, they do not form insoluble salts with hardness ions
Non-ionic detergents perform effectively in hard water because their polar functional groups consist of uncharged polyethylene glycol or polyhydric alcohol chains rather than ionic groups. Lacking charged anionic sites, they cannot react with dissolved calcium and magnesium ions to form insoluble precipitates, remaining fully dissolved and active during cleaning.

**84.** (C) Chlorine
Chlorine is the essential chemical element driving the bleaching and oxidizing capabilities of bleaching powder. When bleaching powder is dissolved in water or treated with mild acids, active chlorine species are liberated. These chlorine molecules react with water to form hypochlorous acid, which releases nascent oxygen to decolorize organic dyes.

**85.** (A) P-4, Q-1, R-3, S-2
Plaster of Paris is used by orthopedists for setting fractured bones. Sodium bicarbonate serves as the main active constituent in baking powder formulations. Washing soda is added to hard water to precipitate hardness ions and soften water. Bleaching powder is added to municipal water supplies to sterilize drinking water.

**86.** (D) Surface tension
Surfactants enhance the cleaning power of water primarily by significantly reducing its surface tension. Soap and detergent molecules adsorb at the air-water interface, weakening cohesive hydrogen bonds between water molecules. Lower surface tension enables water to wet fabric fibers more thoroughly, penetrate dirt particles, and easily displace oily stains.

**87.** (B) Sodium bicarbonate precipitates
Passing carbon dioxide gas through a saturated aqueous solution of sodium carbonate causes a chemical reaction that yields sodium bicarbonate. Because sodium bicarbonate possesses relatively low solubility in cold aqueous media compared to sodium carbonate, it precipitates out of the reaction solution as a white crystalline solid mass.

**88.** (B) Gypsum → Plaster of Paris → Anhydrous Calcium Sulfate (upon further heating)
Heating gypsum dihydrate under controlled conditions at 373 K results in partial loss of water to form calcium sulfate hemihydrate, known as Plaster of Paris. Subjecting Plaster of Paris to further heating above 373 K drives off all remaining water of crystallization, yielding completely anhydrous calcium sulfate, called dead burnt plaster.

**89.** (D) Antacid in medicines
Washing soda, or sodium carbonate decahydrate, is utilized for softening hard water, manufacturing glass and borax, and serving as a domestic cleaning agent. However, due to its strongly basic and corrosive nature, it is never used as an oral antacid; sodium bicarbonate is used for antacid applications instead.

**90.** (A) I and II only
Baking soda must be stored away from acids to prevent premature chemical decomposition and release of carbon dioxide gas. Plaster of Paris requires dry, moisture-proof storage to avoid accidental hydration into hard gypsum dihydrate. Conversely, washing soda crystals should be stored in sealed containers to prevent efflorescent water loss.

**91.** (B) Soft water
The rapid and abundant formation of soap lather indicates that the tested sample is soft water. Soft water contains negligible concentrations of dissolved calcium and magnesium ions, allowing soap molecules to dissolve freely and lower surface tension to generate stable foam without forming sticky insoluble scum precipitates.

**92.** (B) Animal fat : Synthetic detergents
Animal fat is a natural triglyceride used primarily to manufacture traditional carboxylate soaps through saponification. Synthetic detergents are produced industrially from petrochemical derivatives, such as long-chain alkenes and alkylbenzenes, rather than natural animal fats. The other raw material-product pairs accurately

NODIA

represent established industrial manufacturing processes.

**93.** (C) 35-40%
Freshly manufactured, high quality commercial bleaching powder contains approximately 35 to 40 percent available chlorine by weight. Available chlorine serves as a quantitative measure of the total oxidizing power of bleaching powder, representing the amount of chlorine liberated upon treating a specific mass of the sample with dilute acid.

**94.** (C) $C_{17}H_{35}COONa$
Sodium stearate is a representative classic soap molecule with the chemical formula $C_{17}H_{35}COONa$. It consists of a long hydrophobic aliphatic hydrocarbon tail derived from stearic acid containing seventeen carbon atoms, attached to a hydrophilic polar sodium carboxylate head group that enables surfactant behavior in aqueous solutions.

**95.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Hard water consumes significant amounts of soap before any persistent lather can be generated. Dissolved calcium and magnesium cations instantly react with sodium fatty acid salts to precipitate insoluble calcium and magnesium carboxylates as scum. Lather forms only after all hardness cations are completely precipitated out of solution.

**96.** (C) Sodium thiosulfate
In textile processing, sodium thiosulfate is widely employed as an antichlor agent after fabric bleaching operations. Chlorine used during bleaching can remain trapped in fabric fibers, causing yellowing and textile degradation. Treating bleached cloth with sodium thiosulfate solution chemically reduces residual elemental chlorine into harmless, water-soluble chloride ions.

**97.** (B) It promotes algal growth, causing eutrophication
Sodium tripolyphosphate serves as an effective builder in laundry detergents, but its discharge in wastewater poses severe environmental hazards. Polyphosphates break down into orthophosphates, which act as plant nutrients in natural water bodies. This nutrient enrichment causes rapid algal blooms, leading to oxygen depletion and eutrophication.

**98.** (D) Fine white powder
Commercial Plaster of Paris is produced and distributed as a fine white powder. In this dry powder form, calcium sulfate hemihydrate remains stable provided it is stored in moisture-proof containers. When required for medical casts or building applications, the powder is mixed with water to form a moldable slurry.

**99.** (A) It produces carbon monoxide gas upon baking
Baking soda is sodium hydrogen carbonate, $NaHCO_3$, which serves as a key component in baking powder and stomach antacids. When heated during baking, it undergoes thermal decomposition to yield carbon dioxide gas, water vapor, and sodium carbonate. It does not evolve toxic carbon monoxide gas under normal baking conditions.

**100.** (B) III and IV only
The industrial Solvay process involves reacting sodium chloride, water, carbon dioxide, and ammonia to yield ammonium chloride and solid sodium bicarbonate precipitate. Subsequently, the recovered sodium bicarbonate undergoes thermal calcination, decomposing into solid sodium carbonate, water vapor, and carbon dioxide gas, which is recycled back into carbonation towers.

**101.** (A) The hydroxide ion ($OH^-$)
In the basic saponification mechanism of an ester, the hydroxide ion acts as the primary nucleophile. The strongly basic hydroxide anion attacks the electrophilic carbonyl carbon atom of the ester group, forming a tetrahedral intermediate. Subsequent elimination of the alkoxide ion generates a carboxylate salt and an alcohol product.

**102.** (D) They absorb UV light and emit blue light to appear whiter
Optical brighteners are fluorescent organic chemical additives incorporated into modern laundry detergent powders. These compounds absorb invisible ultraviolet radiation present in daylight and re-emit light in the blue region of the visible spectrum. This blue emission compensates for natural fabric yellowing, making

Downloaded from www.pdf.tube

laundered textiles appear significantly whiter and brighter.

**103.** (B) Release of highly toxic chlorine gas
Accidental mixing of household bleach containing sodium hypochlorite with acidic toilet bowl cleaners triggers a hazardous chemical reaction. The acid protonates hypochlorite ions, forming hypochlorous acid which reacts with chloride ions to rapidly liberate toxic chlorine gas. Inhaling chlorine gas causes severe respiratory irritation, pulmonary edema, and tissue damage.

**104.** (C) Wash thoroughly with copious amounts of water immediately
If concentrated sodium hydroxide spills on skin, immediate emergency first aid requires flushing the affected area with copious amounts of running water for at least fifteen minutes. Washing dilutes and removes the caustic alkali quickly. Applying concentrated acids must be strictly avoided because exothermicity from neutralization would worsen thermal tissue damage.

**105.** (D) P-3, Q-2, R-4, S-1
Anionic detergents are major components of household laundry powders. Cationic detergents possess germicidal properties and are used in hair conditioners. Non-ionic detergents serve as liquid dishwashing agents without ionizing in solution. Branched-chain detergents resist bacterial breakdown, exhibiting poor environmental biodegradability in wastewater systems.

**106.** (A) Degree of unsaturation in hydrocarbon chains
The primary chemical distinction between fats and oils lies in the degree of unsaturation within their fatty acid hydrocarbon chains. Fats contain predominantly saturated fatty acid chains, enabling tight molecular packing that results in solid forms at room temperature. Oils contain higher proportions of unsaturated double bonds, keeping them liquid.

**107.** (B) Calcium sulfate
Permanent water hardness is caused by dissolved calcium sulfate or calcium chloride, which remain dissolved upon boiling. In contrast, temporary hardness caused by calcium bicarbonate decomposes upon boiling into insoluble calcium carbonate precipitate. Consequently, boiling removes temporary hardness but cannot eliminate permanent hardness caused by calcium sulfate.

**108.** (A) I, III, II, IV
Hydrochloric acid-based toilet bowl cleaners are strongly acidic with pH below 2. Pure distilled water is neutral with a pH of 7. Laundry detergent solutions containing sodium carbonate builder are moderately basic with pH around 10 to 11. Sodium hydroxide drain cleaners are strongly basic with pH around 13 to 14.

**109.** (A) Sulfuric acid
Sulfuric acid is manufactured globally in higher volumes than any other industrial chemical, often serving as a key benchmark for a nation's industrial output. It is vital for producing superphosphate fertilizers, synthesizing synthetic detergents, refining petroleum, processing metals, and manufacturing various essential industrial organic and inorganic chemicals.

NODIA

**110.** (B) I and III only
Traditional soaps are made from natural fats and oils, whereas synthetic detergents are derived from petrochemical hydrocarbons. Synthetic detergents can be customized for low-foaming or cold-water applications. However, soaps perform poorly in hard water compared to detergents, which do not form insoluble scum with calcium and magnesium ions.

**111.** (D) It reacts with acid to release $CO_2$ gas, cutting off oxygen
In soda-acid fire extinguishers, sodium bicarbonate solution reacts with sulfuric acid upon activation. This neutralization rapidly produces sodium sulfate, water, and abundant carbon dioxide gas. The released carbon dioxide expands over the combustion area, displacing atmospheric oxygen and smothering the fire to extinguish flames effectively.

**112.** (C) Exothermic
The setting of Plaster of Paris is accompanied by a measurable temperature increase, demonstrating that the chemical hydration process is exothermic. When calcium sulfate hemihydrate reacts with water to form crystalline gypsum dihydrate, chemical bonds form within the hydration lattice, releasing energy in the form of heat into the surroundings.

**113.** (B) $Na_2CO_3.10H_2O$
Washing soda is chemically identified as sodium carbonate decahydrate, represented by the formula $Na_2CO_3.10H_2O$. It consists of one formula unit of sodium carbonate bound to ten molecules of water of crystallization within its stable crystalline structure. Anhydrous sodium carbonate lacks these ten water molecules and is termed soda ash.

**114.** (D) To reduce soap solubility, causing it to precipitate out
Sodium chloride is introduced near the end of soap production to precipitate the soap from solution. Adding sodium ions increases the ionic strength and shifts the solubility equilibrium via the common ion effect, significantly lowering the solubility of fatty acid sodium salts and causing solid soap to separate onto top.

**115.** (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A.
Non-ionic detergents do not generate insoluble scum in hard water because their polar structures contain uncharged hydrophilic groups like polyoxyethylene chains. Lacking carboxylate or sulfonate ionic charges, they cannot react with divalent calcium or magnesium cations present in hard water, allowing them to remain soluble and maintain cleaning action.

**116.** (C) Alkylbenzene sulfonate pollution
Widespread foaming in natural rivers and streams during the mid-twentieth century was caused by non-biodegradable tetrapropylene alkylbenzene sulfonate detergents. These early synthetic surfactants contained highly branched hydrocarbon chains that resisted microbial degradation in sewage treatment plants, accumulating in aquatic bodies and generating stable surface foam persistent over time.

**117.** (A) Linear alkylbenzene sulfonates
Linear alkylbenzene sulfonates serve as the primary surfactant cleaning agent in modern commercial laundry powders. These synthetic anionic surfactants possess unbranched hydrocarbon tails attached to benzene sulfonate heads, providing exceptional grease-emulsifying power, high solubility across water temperatures, resistance to hardness ions, and high environmental biodegradability in aquatic systems.

**118.** (D) Sodium carbonate
When baking soda is subjected to high baking temperatures, it undergoes thermal decomposition according to a standard chemical equation. Sodium bicarbonate breaks down into solid sodium carbonate, water vapor, and carbon dioxide gas. The carbon dioxide gas expands the dough, while residual basic sodium carbonate remains in the final baked food.

**119.** (B) It loses water of crystallization, forming dead burnt plaster
Plaster of Paris is calcium sulfate hemihydrate, used medically to set fractured bones. When heated strongly above 100 degrees Celsius (373 K), it loses all remaining water of crystallization, transforming into anhydrous calcium sulfate. This fully dehydrated salt is called dead burnt plaster because it loses its characteristic setting ability.

**120.** (A) I, II and III only
Sodium hydroxide is a major industrial chemical utilized in soap and detergent manufacturing, wood pulp processing for paper production, and degreasing metal equipment. However, it is not used to disinfect drinking water due to its high corrosivity; water disinfection relies on chlorine gas or bleaching powder instead.

**121.** (D) Nascent oxygen from hypochlorous acid
Bleaching powder acts as a powerful bleaching agent because it releases hypochlorous acid when dissolved in water. Hypochlorous acid is unstable and decomposes to form hydrochloric acid alongside highly reactive atomic nascent oxygen. This nascent oxygen oxidizes colored organic chromophores present in fabrics, converting them into colorless oxidized compounds.

**122.** (A) The hydrophilic surface interacts with surrounding water molecules.
In a micelle aggregate, surfactant molecules arrange themselves so that their hydrophilic polar ionic heads face outward toward the aqueous environment, interacting favorably with surrounding water molecules. Simultaneously, the hydrophobic non-polar hydrocarbon tails cluster in the interior away from water, trapping insoluble oily dirt particles inside the micelle core.

Click Here to Buy book on Amazon

**123.** (B) Benzene and long-chain alkenes
Synthetic detergents are manufactured from petrochemical feedstocks rather than natural fats. Long-chain alkenes obtained from petroleum cracking are alkylated onto benzene rings to synthesize alkylbenzenes. Subsequent sulfonation with concentrated sulfuric acid followed by neutralization with sodium hydroxide yields active linear alkylbenzene sulfonate detergent surfactants.

**124.** (B) By using an ion-exchange resin regenerated with sodium chloride
Modern dishwasher appliances incorporate built-in water softeners containing ion-exchange resins to reduce hard water cations. As hard water passes through the resin bed, divalent calcium and magnesium ions bind to the resin, releasing harmless sodium ions into the water. Dishwasher salt, which is sodium chloride, periodically regenerates the resin bed.

**125.** (A) Bleaching the fabric using bleaching powder or natural alternatives
Traditional artisan dyers process raw natural fabrics by bleaching them prior to applying dyes. Bleaching with calcium oxychloride or natural oxidizing agents removes inherent natural pigments, impurities, and yellowish tones from cotton or linen fibers. This pre-treatment ensures consistent dye absorption, enabling vibrant, uniform color application on finished textiles.

**126.** (C) Washing soda
Chemical compound ‘X’ is washing soda, known chemically as sodium carbonate decahydrate. It is an indispensable raw material in glass manufacturing, where it acts as a flux to lower silica melting temperatures. Dissolving washing soda in water produces an alkaline solution due to salt hydrolysis, turning red litmus paper blue.

**127.** (D) Bleach and ammonia
Mixing household bleach containing sodium hypochlorite with cleaning products containing ammonia is extremely dangerous. The chemical reaction generates volatile, highly toxic chloramine vapors, including monochloramine and dichloramine. Inhaling chloramine fumes causes immediate ocular burning, severe respiratory tract corrosion, chemical pneumonia, and potential pulmonary edema in exposed individuals.

**128.** (C) Soft soaps are potassium salts; hard soaps are sodium salts
Soft soaps are manufactured by saponifying fats and oils using potassium hydroxide, yielding soluble potassium fatty acid salts that produce a softer, smoother lather ideal for liquid soaps and shaving creams. Hard soaps are produced using sodium hydroxide, forming sodium fatty acid salts that yield firmer solid bar soaps.

**129.** (B) The alkali amount required to saponify a given fat or oil quantity
The Saponification Value is an important analytical parameter in oil and soap chemistry defined as the number of milligrams of potassium hydroxide required to completely saponify one gram of a specific fat or oil. It provides a direct measure of average molecular weight and fatty acid chain lengths present.

**130.** (D) It expands slightly upon setting to form an airtight seal
Laboratory technicians use Plaster of Paris to seal small gaps and joints in glass apparatus setups. Upon mixing with water, Plaster of Paris sets into hard gypsum, undergoing a slight volumetric expansion of up to one percent. This expansion forces the plaster tightly against apparatus walls, forming an effective airtight seal.

**131.** (A) Its mild basic nature neutralizes excess stomach hydrochloric acid
Baking soda acts as an effective oral antacid because of its weak basic chemical nature. When ingested, sodium bicarbonate reacts with excess hydrochloric acid present in gastric juices. This acid-base neutralization reaction produces harmless sodium chloride, water, and carbon dioxide gas, rapidly reducing stomach acidity and relieving heartburn discomfort.

**132.** (C) Acid neutralization prior to safe discharge
Industrial facilities discharging alkaline wastewater from Chlor-Alkali operations must implement environmental mitigation controls before releasing effluent into natural water bodies. Neutralizing the strongly basic wastewater with controlled additions of acid adjusts the pH to near neutral levels around 7, preventing ecological destruction and protecting aquatic organisms from chemical burns.

NODIA

**133.** (A) Linear alkylbenzene sulfonate (LAS)
Linear alkylbenzene sulfonate (LAS) is an environmentally friendly synthetic detergent because of its high biodegradability. Unlike older branched alkylbenzene sulfonates, LAS features straight unbranched hydrocarbon chains. Bacteria present in municipal wastewater treatment plants easily decompose linear carbon chains via beta-oxidation, preventing persistent detergent accumulation and foaming in aquatic ecosystems.

**134.** (D) Fully hydrated, gypsum does not react with water to form a setting mass
Raw gypsum is calcium sulfate dihydrate, representing a fully hydrated crystalline salt. Because it already contains its full complement of water of crystallization, mixing gypsum dihydrate directly with water produces no further hydration reaction or setting mechanism, rendering it incapable of hardening into durable casting moulds without prior thermal conversion.

**135.** (B) It has low solubility in cold brine
During the Solvay process, carbon dioxide gas is passed through ammoniated brine to produce sodium bicarbonate and ammonium chloride. Sodium bicarbonate precipitates out of the reaction mixture because it exhibits relatively low solubility in cold saturated sodium chloride solution, enabling easy filtration and isolation before subsequent calcination into washing soda.

**136.** (C) Calcium sulfate
Commercial bleaching powder is a complex mixture synthesized by reacting chlorine gas with dry slaked lime. Its primary active component is calcium hypochlorite, accompanied by calcium chloride, calcium hydroxide, and minor moisture. Calcium sulfate is not a component of bleaching powder, as sulfur compounds are not involved in its synthesis.

**137.** (D) It acts as a solvent and humectant, imparting transparency and moisture
Glycerol plays a vital dual role in transparent soap formulations. It functions as a clear solvent that prevents soap crystallization during cooling, allowing light to pass through the soap bar to create transparency. Additionally, glycerol acts as a humectant, attracting moisture to keep skin hydrated during personal bathing.

**138.** (A) Soap concentration must exceed the Critical Micelle Concentration (CMC)
For soap molecules to clean effectively by assembling into spherical micelle structures, the soap concentration in aqueous solution must exceed a specific threshold known as the Critical Micelle Concentration (CMC). Below this concentration, soap molecules exist individually as dispersed monomers without forming hydrophobic core aggregates needed to emulsify oily dirt.

**139.** (B) Sodium hydroxide
Caustic soda is the common commercial name for sodium hydroxide, represented by the chemical formula NaOH. It is a strongly basic, highly deliquescent inorganic solid widely used in paper manufacturing, soap making, chemical synthesis, and petroleum refining due to its exceptional reactivity and strong alkaline properties in aqueous solutions.

**140.** (B) Its amphiphilic nature bridges the oil-water interface
A detergent molecule functions as an effective emulsifier because of its amphiphilic dual structure, possessing both a polar hydrophilic head and a non-polar hydrophobic hydrocarbon tail. The hydrophobic tail dissolves into oily droplets while the hydrophilic head interacts with surrounding water, reducing interfacial tension and stabilizing oil dispersion in water.

www.nodia.in

Downloaded from www.pdf.tube

Visit :
www.pdf.tube

Download PDFs For :

- ✓ UPPSC Chapterwise Question Bank
- ✓ UKPSC Chapterwise Question Bank
- ✓ RPSC Prelims Chapterwise Question Bank
- ✓ MPPSC Chapterwise Question Bank
- ✓ KVS/NVS Chapterwise Question Bank
- ✓ KVS/NVS 30 Sample Papers for Tier-II
- ✓ DSSSB TGT Chapterwise Question Bank
- ✓ DSSSB Sample Papers
- ✓ Chapterwise Question Bank
- ✓ JEE NEET Foundation
- ✓ Primary Classes Worksheets
- ✓ Olympiad Guide
- ✓ Sample Papers
- ✓ Previous Year CBSE Papers
- ✓ Previous JEE, NEET and CUET Papers

NODIA

Nodia Editions LLP
125, Sector 6, Vidhyadhar Nagar, Jaipur 302039

MRP ₹ 580.00